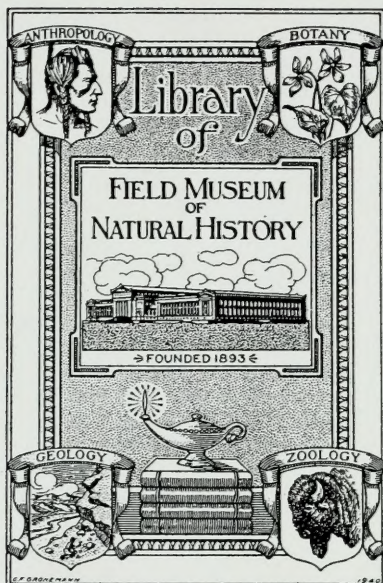


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FLORA
OF
SANTA CATALINA ISLAND
(California)



Carl F. Gronemann, Del.

ESCHSCHOLTZIA WRIGLEYANA sp. nov.
HALF NATURAL SIZE.

FIELD MUSEUM OF NATURAL HISTORY

PUBLICATION 212

BOTANICAL SERIES

VOL. V

FLORA
OF
SANTA CATALINA ISLAND
(California)

BY
CHARLES FREDERICK MILLSPAUGH
AND
LAWRENCE WILLIAM NUTTALL
(Field Collaborator)

14 Plates 1 Map

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Curator, Department of Botany



CHICAGO, U. S. A.

January, 1923

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PREFACE

The Island of Santa Catalina is specially interesting to the Botanist because of the fact that its Flora comprises a greater number of endemic species than any equal area of the Californian mainland.

The strongly marked characters of several of these endemic species has given rise to various theories as to their origin and the geologic status of the island itself.

In order that vegetation may have its true value as a factor in interpreting the history of the island, it is imperative that the Flora be recorded in detail before the advancing activities of Man shall have modified too greatly its original characters.

The wide ranging of large flocks of sheep; the introduction and increase of wild goats; the turning of various springs and canyon streams into conduits supplying Avalon; building; and road construction, are elements working rapid changes in the natural features of the island.

It is in view of these changes that this book is offered as a contribution to the Natural History of Santa Catalina.

SANTA CATALINA ISLAND

(CALIFORNIA)

The island of Santa Catalina lies twenty-eight miles off the coast of southern California at San Pedro, the port of Los Angeles. Its longer axis is approximately east and west, parallel with the mainland. It is twenty-two miles long and varies in width from three to eight miles. Its total area is 48,438 acres. The island is traversed throughout its length by a lofty, precipitous mountain chain only broken by a low valley, near the western end, called The Isthmus. The mountain chain occasionally branches enclosing several broad, fertile, upland valleys, while each branch breaks up into a large number of abrupt and sharp ridges embracing canyons of various depths. Several sharp peaks arise along the range to heights of from 1,400 to 2,000 feet. (See Plate II.)

The whole contour of the island is extremely rugged, being slashed in all directions by "washes" and, from the center toward the sea, by canyons, whose floors are usually narrowed to wedge-shape. These canyons harbor tiny rills, especially in their upper reaches, or at least retain more or less permanent moisture.

The general soil of the island is friable and unstable on the greater slopes. It is most commonly underlaid by tufaceous rock and is pitted nearly everywhere. That of the mouths of the washes and canyons and of the more extensive valleys is generally deep and rich.

Many springs exist on the island and a number of living streamlets, the largest of which runs through Middle Ranch Canyon. This latter is paralleled by two others, one flowing through a sandy valley, in which it frequently broadens into cottonwood bottoms; the other, beginning in a canyon high up in the range, precipitates itself into Silver Canyon through which it flows to the sea.

The western face of the ridge-slopes and canyon sides are the most luxuriously vegetated, as fogs generally come in from the east and, condensing on the higher ridges, bathe those slopes with considerable moisture throughout the winter and spring months. Conversely the eastern slopes are, at that time, dry, supporting only a clumpy vegetation of shrubs and cactus.

Explorative trips on the island should be attempted only by persons physically strong and willing to undergo heavy exertion, even to exhaustion. It is well to keep to the ridges for straight-a-way tramp-

ing and to beware of inviting paths that branch therefrom as they are mostly but sheep trails leading nowhere and finally disappearing altogether. Too often the washes or cañons once entered may be left only by climbing their sides, as they frequently lead to cul-de-sacs or to an abrupt "break-off" high above the sea. On no account should a "short-cut" be ventured except with sufficient daylight ahead and a sure knowledge of direction. Masses of impenetrable cactus; abrupt breaks; deep washes, or still deeper cañons interfere on every hand, making the longest way around generally the shortest way home. The easiest tramps are along the road to Pebble Beach, returning by the upper road; the Summit, by way of the Coach Road; and the Pacific Ridge by way of the road through Avalon Valley and the Equestrian Trail.

PRINCIPAL COLLECTING STATIONS

AVALON:—The shipping harbor of the island, located on the wash formation from Avalon Valley. The bay is crescent-shaped, with a shelving sandy beach, terminated by lofty promontories at each end of the curve. The city reaches back from the beach several blocks to a rather broad, arable valley. A road extends from the eastern end of the front street to Pebble Beach and from the western end to the St. Catherine hotel situated at the mouth of Descanso Canyon. The Coach Road to the Isthmus leaves Marilla Ave. at its first turn, near the Catholic Church, and the Avalon Valley Road continues Sumner Ave. across the Golf Links ending at the Equestrian Trail. Another road to Pebble Beach projects Beacon St. up the east hillside. In the center of the city is a rather high hill (Reservoir Hill), reached by way of Whittley Ave., whence is obtained a fine view of the valley and the sea. It is on the east and west hillsides of Avalon and the Pebble Beach Road that most of the incidental plant collections, of one-day tourists, have been made.

GOLF LINKS and AVALON VALLEY:—The level portion of the course occupies the valley just back of Avalon. It is a sandy stretch upon which many notable adventive plants may be found. Further back in the valley is a saw-mill and a large cultivated area, beyond which is a heavy gravel wash comprising all the remaining level. This is excellent collecting ground for the native flora, especially the shrubs and vines.

AVALON RUN:—(At times of heavy rains a considerable stream) rises at the head of Piedra Escalera Canyon, and, supplemented

by numerous branches, drains the whole Avalon Valley watershed. It is artificially confined where it bounds the arable fields, the Golf Links and the eastern city blocks, finally reaching the sea at the east end of Crescent Ave., or Front Street. The wooded slopes bordering the Run on the east prove productive collecting ground for vernal species.

BEACON STREET CANYON:—The first canyon opening into Avalon Valley on the left, the entrance is by way of the Island Villa Annex. The floor of this cañon is of moderate width expanding somewhat at the first right hand fork. From this point it begins to ascend rapidly, with steep slopes and a very narrow stream bed. The soil is rich and the bed and west slope are well wooded. It proves a good collecting field in early spring for plants that flourish in shaded places. Its bed is dry except during continued rains.

GOLF LINKS CANYON:—The second left hand canyon opening into Avalon Valley. Its entrance is at the point where the golf course crosses Avalon Run. The lower end is very narrow and the slopes steep. It soon begins to rise sharply and terminates at the face of a bluff some distance below the top of the mountain. The soil is rich, the canyon well wooded, and was found to be a good collecting field. The bed is dry except during the rainy season.

BIG WASH CANYON:—The third cañon debouching into Avalon Valley on the left, nearly opposite the saw-mill. Its mouth is a broad pebbly arroya with somewhat extensive grassy levels on its banks. The arroya reaches back about a thousand feet and forms excellent collecting ground for early blooming plants of dry situations. The slopes beyond, at the beginning of the canyon proper, are well wooded and rich, while the bed becomes damp and the larger boulders, impeding the streamlet bed, covered with moss. The cañon early forks into a short left and long right branch, the latter reaching up toward Mt. Wilson. This canyon and its branches form one of the best of the nearby plant habitats in any month of the season.

CANYON OPPOSITE CHICKEN JOHNNY'S:—The fourth canyon opening into Avalon Valley on the left. It is so densely filled with trees, shrubs and vines that very few of the flowering herbs of the canyon floors are to be found here. The upper part is extremely steep and less densely wooded. Here the usual flowering herbs find welcome conditions of light and soil. It faces northeast and is generally dry.

ROCK SPRING CANYON*.—The first cañon entering Avalon Valley on the right at the Golf Links. Its approach is by a branch road, bordering a level field, to the Gas Works, beyond which is a short, gravelly arroya leading to a bald rock face over which a rill trickles throughout the winter and early spring months. Above this rock wall there is a mucky willow-bottom rich in *Mimulus cardinalis*. Beyond this and up the left fork the streamlet lives through April. The two branches are in open, rocky courses and yield few vernal species.

ROCK FALLS CANYON:—The second canyon opening into Avalon Valley on the right. It is separated from Rock Spring Canyon by a narrow, sharp ridge, the Avalon side of which is excellent collecting ground in March and April. Among other plants *Dodecatheon*, *Viola* and *Castilleja* grow abundantly on this slope. Rock Falls Canyon early develops a lively streamlet flowing through a narrow, open, boulder strewn bed, and soon forking above. The left fork is the wetter and shadier. It contains a pipeline that runs back over the ridge mentioned above and on over to the two water tanks on the left slope of Rock Spring Canyon. This left fork is good foraging ground for mosses and moisture-loving vernal species.

CHICKEN JOHNNY'S:—A group of farm buildings on the right of the road a short distance beyond Rock Falls Canyon. A good hunting ground for adventive plants, many of which, like *Nepeta Cataria* and *Ruta graveolens* Johnny claims were introduced several years ago through his importation of "mill screenings" for chicken feed. He wisely asserts that: "It is good for chickens to scratch aroun' for their food, 'stead of gettin' it too easy"; he, therefore, made a practice of scattering the screenings widely about his place, where a large number of fowls had open range.

PIEDRA ESCALERA CANYON:—This canyon opens on the right hand side of the Equestrian Trail to the Pacific Ridge at the point where the trail continues the roadway. For some distance from its mouth the creek bed is cut deep and narrow through an alluvial deposit. There is a broad glade on the left which soon narrows to a steep canyon slope. A quarter of a mile above the mouth the canyon bed begins to ascend very rapidly, the greater part of its course lying over solid rock. The right hand branch harbors a streamlet which is lost a short distance below the junction of the forks. If for nothing more, the cañon is worthy of a visit to view

*Also known as "Graveyard Canyon" and latterly as "Gas Works Canyon."

the rock formation which, in places, resembles a giant staircase (hence Piedra Escalera). It is easy of ascent but proves a poor collecting field at any season. However, in the frequent boggy pockets of the stream bed, there is an abundance of *Typha*, *Mimulus cardinalis* and many commoner water-loving plants.

EQUESTRIAN TRAIL:—This newly made trail, built in 1919 for the accommodation of day-visitors to the island, begins at the end of the valley road and zig-zags a thousand feet upward to the Pacific Ridge. If one has but a day to expend on the island Flora no better or more fruitful tramp offers than the valley road and the ascent of this trail. These lead through almost all the peculiar plant habitats except the arid and the saline. At the beginning of the trail is a large *Sambucus* tree, three species of *Rhus*, and just beyond, a glistening thicket of *Scrophularia*. Two species of Oak are soon encountered, and nearly all the ferns of the island. About a third of the way up, the trail elbows in a damp wash gulley where *Urtica*, *Parietaria*, *Hesperocnide*, *Montia*, *Bowlesia*, *Ranunculus*, *Geranium*, *Ellisias*, and many other shade-loving species are to be found. At the last third the trail is bordered by a few clumps of *Ribes* and soon passes through a considerable extent of *Adenostoma*. Issuing from this it is open to the summit, from which spreads a wonderful view: To the south, almost beneath, lies the colorful Pacific with the island of San Clemente resting like a mysterious cloud on the horizon; to the right stretches the rugged, painted cliffs of the Palisades; to the left the ridges and hills leading to the base of Mt. Shatto (1500 ft.); looking backward to the north Avalon and the valley lie at one's feet. On clear days the mainland and San Pedro Point are plainly discernable beyond the placid channel which is dotted with seemingly miniature ships with their ever widening wakes.

At this point the made trail ends in several natural branches: That to the left leads, plainly marked, to Mt. Shatto; that to the right may be followed down to the Pacific break-off or on to Silver Knob (1,380 ft.).

NOLAVA (Reverse of Avalon) CANYON:—This very deep defile lies directly over the ridge from the head of Avalon Canyon. This should be entered only by following the trail to Mt. Shatto as far as the head of Big Wash Canyon. The slope of Nola is too steep and too dangerous to be safely negotiated before that point. The lateral branch by which you now enter has a steep and narrow stream bed with scarcely any vegetation except cactus and sage.

Below these the bed is moderately wide and more easily traversed. Its vegetation is that common to open, dry canyons elsewhere and not notably interesting. Even at its lower reaches the soil appears barren. As a whole this cañon will not repay the plant collector the effort of exploration at any season.

SNAKE CANYON:—(Because the co-author here encountered and killed his first rattlesnake May 25th.) A comparatively short canyon lying between Nolava and Silver Canyons. It is entered at a point on the trail from the summit of the Equestrian Trail toward Silver Knob near the head of Piedra Escalera Canyon, and descends to a precipitous cliff on the Pacific shore. Little interest lies in the vegetation of this canyon after early spring, though it is possible that, about half way down, it may yield more species at that period.

SAGE CANYON:—A deep canyon whose watershed includes the slopes between Snake and Silver canyons. It is reached by turning to the right at the terminus of the Equestrian Trail on the summit of the Pacific Ridge, and may be entered from a saddle between two higher points of the ridge (this saddle being the lowest section of the divide between the ocean and the channel). Sage Canyon has three deeply cut left hand branches reaching far up toward the watershed of Silver Canyon on the west; and three right hand, shorter and deeper branches reaching the summit ridge which divides this from Snake Canyon. A living spring flows from a point below the junction of the main branch with the third, and the highest left hand branches and is the source of the pools lying throughout the entire year in the canyon bed. The floor is quite narrow, rocky, and of little interest. The slopes are covered with sage* and cactus except those of the right hand branches—these face the north and are densely wooded with Oak, Holly, and Catalina Cherry, all low and spreading, Sour Oak, Catalina Perfume and other shrubs. A visit to this canyon is not recommended, as it is so densely covered with Sage, in areas, that even a fair-size animal cannot get through. The only way to get down it is to walk on top of the sage brush—a stray dog that attached himself to us could neither go over nor under the brush and was forced to remain behind. The mouth of the canyon opens precipitously to the Pacific, a hundred and fifty feet above the beach, rendering it impossible to descend to the shore.

SILVER CANYON:—While this interesting canyon, one of the largest on the island, may be reached by following the ridge to the

**Ramona stachyoides*.

west from the Equestrian Trail, or ascending that beyond Chicken Johnny's, it is far more profitable to the plant observer to enter it from the Coach Road: Turn abruptly to the left at the Summit and follow the top of the ridge for half a mile noting that you pass the heads of several branches of Grand Canyon before you reach the numerous hollows that descend into the main streamlet of Silver Canyon. The upper reaches of all the branches of Silver Canyon are encompassed by rolling hills comparatively free of trees. Its slopes are densely covered with grasses, amongst which, during February, March and April, may be found a large variety of interesting herbs. The canyon contains water throughout the year. Below the junction of the uppermost branches it becomes suddenly precipitous and difficult all the way down to the main branch of Grand Canyon, which enters it from the northwest. A short distance below this junction the creek bed nearly reaches the level of the ocean. From here on the bed is very wide and flat and is composed of loose rock, sand and a tangle of drift rubbish. It proves an excellent bottom for cottonwood and tree tobacco, but is not a profitable collecting place after the early spring months.

GRAND CANYON:—The main branch of Silver Canyon; so named because of the presence of three falls, the lowest of which is perpendicular and perhaps sixty or more feet in height. The precipitous walls on either side make it difficult to climb. The main streamlet is reached from a point where the Coach Road passes the head of Gallagher's Canyon about half a mile west of The Summit, marked by a broad, grassy glade known as the Hay Press. The upper reaches of the canyon comprise one of the interesting collecting fields. The main branch is indicated by a long stretch of willows overhanging a deep gulch, a fine collecting ground for lichens and fungi. The canyon beyond the willows does not have the appearance of being worth the effort of exploration by the botanist.

BULL RUSH CANYON:—This canyon lies parallel with Middle Ranch Canyon and between the latter and the Pacific. It is separated from Middle Ranch Canyon by a continuous high ridge known as Bull Rush Ridge and from the Salta Verde by the Salta Verde Ridge. The head and central portions of the canyon consist of beautiful stretches of open, park-like glades densely clothed with tall grass and here and there extensive groves of oak, holly, cottonwood, willow and greasewood. (See Plate VI, f. 2). It is here that the largest *Quercus tomentella* trees flourish, many individuals being 70 feet high with a spread of over 100 feet. Sections of this oak growth are frequent in which the trees are killed by an enveloping mass of poison

ivy whose stems, like intertwining pythons, often reach a diameter of over 4 inches (See Plate XII, f. 3). The lower, or western, portion of the canyon consists of a steep, boulder-strewn gorge whose walls defy even the wild goat in finding a footing. Among the rocks in the narrow stream bed are masses of gnarled and twisted willows, cottonwoods, oaks and Trask's Mountain Mahogany (*Cercocarpus Traskiae*).

SALTA VERDE:—A stretch of the southern-central portion of the island about five miles long by two miles broad. It extends from Mt. Viscanio westward and lies between Bull Rush Canyon and the Pacific. This area slopes abruptly toward the Pacific and is traversed by many steep and difficult canyons and gullies. The ridges and gullies are clothed with salt-grass, sage-brush, cactus, stunted oak and *Neostyphonia integrifolia*.

LAVA BEDS:—In several parts of the Pacific Slope of the Salta Verde are found barren lava beds and soils of volcanic ash. From one of these, about a quarter of an acre in extent, water oozes in rivulets forming a verdureless bog impossible to traverse. Though the water is clear and inviting it will be found bitter and repulsive.

COACH ROAD:—Continuing from Marilla Ave., Avalon, past the Catholic Church and ascending above Sugar Loaf around the point to the east slopes of Descanso Canyon. The road mounts at a 10 per cent grade to The Summit, three miles up. The first stretch, as far as the ridge between Descanso and Avalon Valley, affords little of interest except the wide and attractive view, but beyond this the spring flora is well displayed. In February the Descanso slope is beautified by the sheep-like clumps of purple lupine and farther up, in early March, the "lilac" clothes the mountain sides in a diaphanous heliotrope mantle. The best collecting ground is at the second loop, the Wishbone, where a spring provides permanent moisture. Beyond this the heights become dry and the ultimate crest nearly arid. The Summit commands a panoramic view of the westerly stretch of the island range (see Plate II) including Orizaba (2,109 ft.) and Black Jack (2,000 ft.); at the left the upland valley is seen to extend to the horizon line. From The Summit the road winds downward, at an easy grade, past the heads of many channelward and oceanward canyons, to the upper end of Middle Branch Canyon which it follows to the Ranch. The head slopes of Gallagher's and Banning's Canyons afford fine collecting ground from the last week of March through May, as do also the moist gulches that abound along the road.

TRAIL TO BLACK JACK:—This attractive trail begins on the summit ridge between the heads of Banning's and Middle Ranch Canyons at the point where the Coach Road turns abruptly to the left to descend into Middle Ranch Canyon (see map). At first it follows the summit ridge, keeping Banning's Landing always in sight, to a high point facing the channel side, at a large semi-detached rock, where it is lost. Here one turns abruptly to the left and picks up the trail again at the foot of the hill on the narrow dividing ridge between Swain's Canyon and the watershed of Middle Ranch Canyon. It follows this ridge, keeping White's Landing ever in plain sight except where it turns to the left around several steep hills quickly to come back in view of White's Landing until the foot of the terminal dome of Black Jack is reached. Here are great quantities of the endemic *Eriodictyon Traskiae*. The dome of Black Jack is perhaps four or five hundred feet above this point and is treeless, harboring but few small shrubs. The ascent is easy except on the side facing Cottonwood Canyon. The summit is almost destitute of vegetation, the few plants growing there do not materially differ from the same species at lower altitudes.

ECHO LAKE:—On the northeast side of Black Jack, a short distance below the trail, at the head of a lateral branch of Swain's Canyon, are two groves of *Lyonothamnus*; one spread out across the head, the other lower down on the east side. Several hundred yards beyond this point the trail reveals a view of Echo Lake (see Plate IV). It is surrounded by high hills on three sides and is situated in a cove, behind Long Point, which faces south and has a constricted opening with a ridge, a few feet in height, across its outlet. The little bowl, in which the lake lies, is destitute of trees and shrubs. The shore lines are plainly visible from the trail. The lake appeared, at the time of sighting it, in mid September, to be devoid of water* and hardly worth a visit. It should be very interesting, to the botanist, in spring.

HAY PRESS CHUTE:—From the Summit the Coach Road descends gradually beside a small gulley which carries the excess water from rare freshets into Grand Canyon. A half mile beyond the Summit the Hay Press Chute is entered. Here the hills come close together making a narrow defile with barely room for the deeply cut gulley and the road. This is an attractive spot on account of the forest-covered west hillside. The defile opens beyond upon a broad upland

*Dry July 3, 1921—Knopf; full Apr. 10, 1922—Knopf.

meadow called the Hay Press. At the lower end of this meadow the deep gulley is lined with willows which mark the entrance to Grand Canyon.

THE GAP:—The narrowest defile along the road, situated about a mile beyond the Chute at the second bridging of the stream. This defile and its stream bed yield a number of species of more than ordinary interest. Just beyond the Gap the streamlet sinks out of sight early in summer, leaving the creek bed dry all the way to the Middle Ranch buildings below which the water again breaks forth.

CAPE CANYON:—About a quarter of a mile before reaching Middle Ranch and with its buildings in sight, the road crosses the stream bed at the mouth of this broad, fertile valley which reaches up to the foot of Black Jack. The gradient is gentle, as are also the bordering slopes. A walk up this valley is one of the most delightful on the island. Many of the less frequent trees and larger shrubs are to be seen here and at a point about a mile from the entrance is the island's largest expanse of *Xanthium spinosum*. Following the valley directly north throughout its length the trail to the Summit and Black Jack is encountered at the point where the view of the channel first opens.

MIDDLE RANCH:—An extensive group of buildings and broad, gently rolling, cultivated fields through which flows a brook of size; clear and rippling it affords a home for considerable masses of Watercress and its banks, bordered by willows, a shady place for a number of species rare elsewhere. Middle Ranch creek bed is a rich collecting field throughout its length. The upper right hand branch and the upper end of the main channel contain water through the summer. Then follows three or more miles of perfectly dry creek bed which is deeply cut through the rich soil of the gently sloping glade and through the pasture lands and cultivated fields of the ranch. The dry creek bed is even more interesting than the watered parts of the canyon. Below the ranch a flowing brook supports a luxuriant growth of trees and plants and is a favorite resort of the birds of the interior regions.

EAGLE'S NEST:—A mile or more below Middle Ranch the Coach Road passes through a small, well wooded glade known as the Eagle's Nest where is still standing an old road-house much used in stage coach days. The interest in this locality lies chiefly in the name and the luxuriance of the vegetation of the creek bed. Near the ocean, and in full view of it, and of the fine beach at the mouth, the road

crosses the creek and, ascending the dividing ridge, descends into Cottonwood Canyon.

COTTONWOOD CANYON: In the upper reaches of this canyon vegetation is confined to the floor which is broad and interspersed with groves and grass covered meadows. The ground descends gradually for a mile or more and is entirely dry. Beyond the meadows, however, the canyon suddenly narrows and between this point and the Coach Road gathers water sufficient to form a stream which, with the possible exception of Middle Ranch Creek, is the finest on the island. The lower part of the canyon is an excellent collecting field. On the left side of the creek, at its mouth, the Cholla cactus has the appearance of having been introduced, it can be traced from the very edge of the beach diagonally up the mountain side to the Coach Road. The road ascending the ridge on the western side reaches the summit near the ocean front on a rolling plateau, once the site of an Indian village. Here the best view obtains of the Little Harbor region. Descending the western side the road crosses the creek, dry at this point, and ascends the central ridge on which the Road House is located.

LITTLE HARBOR:—Located on the southwest shore of the island about eighteen miles from Avalon. At the mouth of Middle Ranch Canyon the high ridges which parallel the Pacific from Lookout Point abruptly end. The only ridge which runs parallel with either shore, entirely across the Little Harbor region, is one near the channel side which extends from Black Jack to a point near the Isthmus. A high ridge has its southern end close to the northwest side of Little Harbor and extends toward the Isthmus, parallel to the Pacific, for some distance. Thus the Little Harbor region forms, as it were, a gateway to the center of the island and exposes to view, from the Pacific, a greater area than can be seen at any other point. Two large Indian villages were located here on the sites of which excavations have brought to light many interesting remains. There are three main ridges, with canyons between, extending fan-like from the harbor. The lower ends of these ridges are smooth and barren and slope toward the ocean to a precipitous water front. One central ridge extends down to the middle of the small bay and ends in a bold but not high rocky promontory, on the top of which stands the old Road House. As one views the country from the rear of this old building one is impressed by the barren appearance of the region, the marked dearth of trees up

to the top of the channel ridge. The southeast side of the ridge is somewhat steep, but the northwest side, toward The Isthmus is a gentle grassy slope to the creek bed. Extending from the foot of the ridge is a broad meadow which passes on over the ridge and part way up the slope of Little Spring Canyon. Through this meadow are two stream beds, one on the south side and the other on the western, both, except in the close vicinity of the beach, dry in summer. Here there appears to be a quantity of underground water which forms a bog in each creek bed. That on the western side is the largest and most interesting to the botanist. The meadow between is rather sterile only producing such plants as sedges and those that find their habitat in undrained soil. This meadow would prove a good collecting ground in Spring especially for short-lived annuals. Farther away from the Pacific, up through the Little Spring Canyon, vegetation becomes more varied and rich and before reaching the channel ridge there are numerous groves of small trees, all far removed from the Pacific in well protected valleys facing the channel side.

ISTHMUS:—A broad valley extending between Isthmus Harbor and Catalina Harbor and cutting off the west end mountains from those of the main body of the island. It extends north and south, is nearly level, and only about a quarter of a mile from harbor to harbor. It contains a number of buildings and Banning House, the latter located on a knoll rising at the base of the foothills on the east. The particular points of interest to the botanist are:

ISTHMUS HARBOR:—Whose shores abound with species that are rare elsewhere, *Mesembryanthemum* and a number of crucifers. About half a mile to the east lies

FISHERMAN'S COVE:—The former location of Mrs. Trask's summer home. On the slopes of the surrounding hills many of her most interesting finds may be regathered; such as *Trifolium microcephalum*, *Tithymalus helioscopia*, *Gilia dianthiflora*, etc.

BIRD ROCK:—(Plate III, f. 2.) About a half mile off Fisher-man's Cove. It appears above the channel waters as an oval, rounded, cemented rock about 300 by 500 feet in extent and 20 feet high. The rock is white with guano and bare except for a limited patch of vegetation on the southeast side. The vegetation consists mostly of *Opuntia* among which grows about forty individuals of *Cosmos gigantea*, six shrubs of *Lavatera*, and a few plants of *Malva rotundifolia*. This rock is doubtless the original Catalina station for *Lavatera* and the only

place where it grows naturally. Ship Rock (often called Bird Rock), lies about a mile out to the northwest from Bird Rock. It is 66 feet high and devoid of vegetation. The oldest fisherman of these waters claims that there never were, to his knowledge, any plants on it. Lyon claims it to be the station for *Lavatera*.

IRONWOOD GULLY:—An open wash in the east hillside just beyond Banning House. The climb to the clump of *Lyonothamnus* trees, about three-quarters the distance to the top, is interesting as the slope is rich and yields many notable species, especially *Allium*, *Calochortus* and *Antirrhinum*.

CATALINA HARBOR:—The shores of this long and sheltered bay form one of the notable collecting places of the island. The head of the bay extends into a small mud-flat salina where *Suaeda*, *Atriplex* and other salt-loving species abound, while the banks yield both species of *Mesembryanthemum* in profusion. Toward the harbor mouth, putting out from the east shore, is a striking pebble spit known as:

BALLAST POINT:—Enclosing one of the two limited tide bogs of the island. In this *Coinogyne*, *Heliotropium* and *Pholiurus* are found, while the higher, pebbly bank, yields *Cressa*, three *Lepidiums* and other plants of peculiar interest.

Beyond the Isthmus the road extends along the coast as far as Johnson's Landing. It is mostly level, or has but slight grades, and is one of the most picturesque and delightful walks at this end of the island. The first point of interest along the road is

FOURTH O' JULY:—A small, nearly rectangular, oblong bay, setting about 300 feet into the land. It is delightfully pellucid and has a sloping gravelly beach and an interesting but narrow level bottom. The left hillside is almost entirely clothed with *Adenostoma*.

CHERRY VALLEY:—A beautifully wooded valley running straight up, through a luxuriant cherry grove, into the hills. The mouth is a fine and rich bottom ending at a narrow, pebbly beach. This encloses a small salina which is the habitat of many interesting species. The pebble beach is richly clothed with *Pterostegia drymarioides*.

HOWLAND'S:—A broad and shallow valley ending at a long, curved, level beach divided by a peculiar group of projecting rocks. The level back of the beach has a number of buildings and a pumping station for the water supply of the Isthmus. On this level may be found a number of adventive species.

The road from here to Johnson's Landing has rich banks yielding *Cardamine californica* and *Dendromecon*.

JOHNSON'S LANDING:—A broad beach back of which extends a broader valley shallow and open, the site of an ancient Indian village. A large Eucalyptus tree stands in the center of the level and at the east side, near the shore is an extensive glade of *Foeniculum* resembling a cane-break and a group of very large fig trees. Just over the low ridge at the west of the valley are the

SOAPSTONE QUARRY and PARSON'S LANDING. The ascent from Johnson's valley to Soapstone Quarry is very easy, passing over a slope destitute of trees or shrubs. This should prove good collecting ground when Spring follows a winter of frequent rains. The quarries are very irregular, containing numerous pockets, in which is more or less moisture, where *Typha angustifolia* and *Cyperus* may be found. On account of the upturned soil and disintegrated rock, combined with moisture, this spot should also be good collecting in early spring.

Between the quarries and the far side of the broad valley there are grassy slopes interspersed with groves of trees. Immediately against the western ridge there is a narrow gorge in which water is to be found throughout the summer. This is one of the drinking places of wild goats, more being encountered here than in any other part of the island. This stream bed opens through a narrow gorge to Parson's Landing, a narrow, rough, wild beach marking the western limit of our collecting field.

PEBBLE BEACH ROAD:—This road begins at the east end of Crescent Ave., Avalon, and skirts the shore for about a mile to Pebble Beach. It is bordered on the right, almost its entire length, by a series of break-offs of the steep mountain side. At its beginning there is a beautiful and characteristic clump of *Lavatera* shrubs (transplanted), while the talus of the cliff supports several species of *Lupinus* and *Astragalus*. Near the incline railway several patches of *Cosmos gigantea* are to be seen well up the broken cliff. The whole extent of the cliff side of the road is interesting collecting ground for species of dry situations. As the road reaches Pebble Beach it continues to skirt the foothills to the right, enters Pebble Beach Canyon wash, and terminates in a climb to the garbage dump half way up Lookout Point.

PEBBLE BEACH: (Plate III, f. 1)—An extensive and interesting curving beach with a broad strand backed by a ridge of peculiar,

large, rounded, smooth pebbles. This ridge supports, at its eastern end, an important flora and encloses throughout its length a level, nearly dry salina comprising the entire flat land back to the foothills. Here, among other interesting species, are to be found the early crucifers; the endemic *Plantago Parishii*; *Sphaerostigma bistortum* and on its marginal banks all the Phacelias of the island flora.

PEBBLE BEACH CANYON:—Extends south from the eastern end of the beach and is the most fertile and luxuriant narrow valley on the island. The floor of the canyon is well wooded up to the first left fork and is a favorite walk as well as camping and picnicking place. The tree growth is principally Elder, Oak and Catalina Cherry. Here and there lies a sunny bank bright with *Delphinium* and other attractive flowers. It is densely carpeted with grass, even under the trees, with many a deeply shaded copse bordered by wild rose and snowberry bushes. The creek bed through this lower stretch is dry, exceedingly rocky, and has high, perpendicular banks.

The mouth of the first left hand fork opens as one of the most delightful sylvan glades of the island backed by a fine grove of *Quercus tomentella*. Beyond this grove the valley is well wooded and grass-covered wherever the sun can penetrate. Where the shade is dense many ferns may be found and midway up its canyon is one of the few stations of *Adiantum capillus-veneris*. Beyond the wooded part, in its upper reaches, it forks to the left and emerges into a dense cactus field. Its main lead, however, runs up to beautifully rounded grassy slopes lying on the eastern side of Mt. Shatto. Here the grass of the main lead terminates in a fine mass of *Ribes viburnifolia*—"Catalina perfume." This lead is dry throughout the summer.

The main lead of Pebble Beach Canyon, beyond the left fork just described, changes in character very rapidly; water is encountered immediately forming in a succession of pools in which most of the water-loving grasses and herbs of the island may be found. There are sloping and perpendicular rock masses, over which the streamlet constantly trickles, where mosses and ferns luxuriate. In attempting to ascend this lead past the nesting place of the ravens, in the Cottonwood grove a quarter of a mile above the junction, progress is noisily contested by the birds; they apparently make every effort to discourage further intimacy. Above this point it is impossible to follow the creek bed on account of tangled vines, briars and shrubs. Clambering around this and re-entering the creek bed one of the most entrancing nooks of the island is soon reached. The canyon is blocked

at this point by a perpendicular cliff twenty-five feet high, and fifteen wide, its face and sides completely clothed with ferns and mosses kept bright and green by the continually dripping water which forms a little transparent pool at its base. This densely shaded spot is well worth a visit. The top of the cliff may be gained by climbing the bank on the left with the aid of exposed roots and projecting rocks. Here again conditions abruptly change: the country is open to the sky; less densely wooded; grassy; and slopes begin to appear which ascend gradually to the summit of the divide. The creek bed is perfectly dry and cut deep through rich, fine soil, with wall-like banks so steep that search must be made to find a place that can be scaled. A final short climb up the side of a barren ridge and the top of the Pacific Ridge is gained. Turning to the right, on the ridge trail, and passing over the top of Mt. Wilson, a fine view is gained of the deep gorge of Nolava Canyon. Passing the upper reaches of the right hand branch of Big Wash Canyon, and the left hand branch of Avalon Canyon the Equestrian Trail is reached, leading down to Avalon.

LOOKOUT POINT:—A high promontory closing the eastern extremity of Pebble Beach. It is abrupt to the sea and cannot be passed along the shore. The road ascends nearly to the summit to a leveled point where garbage from the city is dumped over the cliff to be attended to by the ravens. The shore may be gained by descending this malodorous dump though the passage is not recommended being dangerous, and, from a botanical standpoint, hardly worth the risk.

JEWFISH POINT:—Near the southeast extremity of the island, may be reached through difficult and uncomfortable scrambling about among the rock debris along the shore. From the base of the garbage dump to the point the vegetation is sparse and clumpy. *Nicotiana glauca*, *Rhus laurina*, *Madia exigua*, *Zauschneria*, *Perezia microcephala*, *Rhus integrifolia*, *Castilleja foliolosa*, *Ramona stachyoides*, *Eriogonum giganteum* and *nudum* and a few shrubs of *Heteromeles* comprise, in the main, the plants noted here. Immediately north of the Point there is a rocky watercourse a short distance up which the banks give footing for *Ribes viburnifolium*.

The following stations, lying west of Descanso Canyon, are described as they appear from the sea, that being the readiest method of approach.

DESCANSO CANYON:—The first canyon west of Avalon, with the Hotel St. Catherine occupying the full extent of its mouth. The

slopes on the left are very steep, richly grassy and harbor considerable moisture. Here is an excellent collecting ground for plants flowering in February and March as well as such adventive established species as *Bolboxalis cernua*, *Linaria*, *Konigia maritima* and *Reseda odorata*. The right hand slopes are dry and cactus strewn; they lead up to a narrow ridge separating Descanso from Hamilton Canyon. Beyond the hotel buildings the canyon soon narrows and affords an easy ascent to the Coach Road at a point midway between its two loops.

HAMILTON CANYON:—Just over the ridge west of the hotel. Like Descanso the left hand slopes are grassy and richly vegetated; they afford the earliest blooming place for *Dodecatheon* and *Eschscholtzia*. The broad level at the mouth is fertile and proves a profitable nearby field for collecting. Some of the finest *Solanum Wallacei* bushes of the island may be seen here and the earliest flowering plants of *Cirsium occidentale*. The canyon is interesting throughout its ascent to the Coach Road which it meets just beyond and to the right of the Wishbone.

CHERRY CANYON:—A small, narrow canyon, with about 200 feet of pebble beach at its mouth. Viewed from the sea a sharp pointed rock, 25 feet high, lies at the right and a cluster of white rocks stands out plainly above the vegetation a short distance up the canyon. At first the canyon bed is choked with tangled bushes, later with rock, then it opens up into an easy climb throughout its short extent.

RATTLESNAKE CANYON:—The next canyon to the west from Cherry Canyon. It breaks off abruptly at the beach with rock at each side of its narrow mouth. This canyon is not at all difficult of exploration. It proves one of the most favorable localities for Catalina perfume and Catalina cherry.

GALLAGHER'S CANYON:—From the sea this canyon presents an ample gravel beach cut at its western quarter by a projecting mass of isolated rock and at the eastern by a grotesque pile of lava. The canyon has a fairly broad wash-level marked by a small house at the base of the east slope and a dense clump of good size *Sambucus* in which the climbing form of *Toxicodendron* may be seen. A short distance beyond the beach the canyon divides into east and west branches with a narrow, abrupt mountain ridge between.

This is the first canyon heading on the right at the Coach Road after passing the Summit. The descent from there into either branch is exceedingly steep. On the descent into the left hand branch from the ridge between the two branches, perhaps 200 ft. above the creek

bed and standing on a steep lateral hollow facing eastward, is a grove of the healthiest and largest *Lyonothamnus* trees to be seen on the island.

The bed of the creek in this canyon is easy to work and will prove an interesting collecting region throughout the year. In a few places there is moisture though no flowing water. Some distance above the mouth of the main canyon the central ridge terminates in a broad glade extending to the beach. The main right hand branch of the canyon, lying close to the central ridge, is more heavily wooded and, in its upper reaches, is harder to climb because of the thick under brush consisting in places of *Ribes viburnifolium* and *Lonicera*. There are damp stretches midway up the mountain. On the brow of a very steep lateral ridge, facing north, 200 feet above the creek bed on the left side, there is a grove of *Lyonothamnus* trees at a much lower altitude than those of the left branch. This grove is in poor condition—apparently dying out. Below this point, on the banks of the creek, is the largest and finest grove of *Quercus tomentella* and the most striking forest scene on Catalina. In the wet season this proves one of the most productive fields for collecting fungi, especially those species which grow on damp, shady ground.

BANNING'S CANYON:—Is next west of Gallagher's and somewhat similar to it in that it has two main branches, separated by a high dividing ridge. There is a broad, flat, rich glade of about 30 acres leading in from the beach upon which grows a jungle of *Nicotiana glauca*. In this are also a number of fine *Heteromeles* trees.

The left hand canyon is less interesting. The right branch is larger and has several further right hand branches extending up to and on each side of the summit of Mt. Banning. There is water in the main right hand branch which is easy of ascent for a half mile but grows steep and difficult farther on. On the precipitous brow of a lateral ridge, one half or three-quarters of a mile from the beach and 200 feet above the creek bed, there is an interesting grove of *Lyonothamnus* trees. From this grove another and finer one is to be seen in one of the lateral canyons high up and to the left of Mt. Banning. This main right hand branch is excellent collecting ground in the spring.

WHITE'S LANDING and SWAIN'S CANYON:—The mouth of the canyon forms one of the finest beaches on the island. The wash here is broad and valley-like extending inland an unusual distance. It may be said that there is no main canyon as it resembles a meadow with canyons radiating from it around an arc of nearly 180°.

On this great wash deposit grow many interesting shrubs especially the uncommon *Malvastrum fasciculatum*, and *Solanum Wallacei* 12 feet high. The first canyon to the left parallels the shore, running up toward Mt. Banning; the second to the left and the left branch of the third also run up to the Mt. Banning watershed, the main bed of Swain's Canyon is easily reached by way of the ridge between these. From the right fork of the third left hand canyon to Black Jack there are several short and steep canyons generally ending in perpendicular cliffs which sharply define the watershed between Swain's and Middle Ranch Canyons. Beyond Black Jack, and between it and the mountains which constitute Long Point, the heights break away and the canyons on this side slope gradually until lost in the watershed between Swain's and Cottonwood Canyons.

The longest right hand canyon, beyond the landing, parallels the shore in a northwestern direction extending up behind Long Point and draining the southern slopes of its mountains. It also constitutes the outlet of Echo Lake which nestles in a little cove against these mountains with its opening toward the south.

There are small groves of trees scattered over this wide area including most of the common species, as well as several groups of *Lyono-thamnus*. The upper reaches of the canyons are open and treeless except under the northern shoulder of Black Jack. The stream beds of the left hand branches are deep and well shaded but, at the time of our visit in July, were dry exhibiting no blooming plants of interest.

The varied degrees of light and shade in these canyons should produce a great variety of early spring flowers. The floor of the main valley and the lower end of several of its lateral branches are filled with deep, rich soil supporting a heavy growth of grasses and shrubs. The absence of large trees is doubtless due to the fact that this was the site of an ancient Indian village.

COLLECTORS AND BIBLIOGRAPHY

The most important collections (numerically) made on the island are those of Lyon, Trask, Hasse, the Brandegees, Reed and Pendelton, Grant and Wilson, Smith, Knopf and the authors. Of these and others the herbarium of the Field Museum of Natural History contains the largest aggregation—over 3,500 sheets.

So far as we have been able to amass the data, the following list of collectors embraces the principal field-work done on the island:

BABCOCK, E(rnest) B(rown).

Spent about a month collecting in the vicinity of Avalon in the spring of 1901. The specimens were deposited in the herbarium of the Univ. Calif.

BAKER, C(harles) F(uller).

Spent a few hours (accompanied by his wife), in 1902, and March 14, 1904, collecting (mostly lichens and fungi) in the small wash back of the Catholic Church, Avalon. The lichens are in herb. Hasse, Harvard Univ. The fungi in herb. Ellis, New York Bot. Gard.

[1] "Notes on the Fauna and Flora of Catalina Island"—So. Cal. Acad. Sci. 4:56-59 (1905).

BAKER, M(arcus).

See Dall & Baker.

BARNHART, J(ohn) H(endley).

Collected in the vicinity of Avalon, Aug. 4, 1901. The few specimens (about 12) we have been allowed to examine in his private herbarium.

BARTHOLOMEW, Elam.

Accompanied by his wife he collected 6 species of fungi in the neighborhood of Avalon on July 19, 1915 (5885-5890). The specimens are in his private herb. with duplicates distributed in his exsiccati: "Fungi Columbiani" and "North American Uredinales". A complete series in herb. Field.

[1] "Puccinia Agropyri E. & E". Jour. Mycol. 7:131.

BECKWITH, Florence.

Of the University of Rochester, N. Y., spent a few hours (on June 5, 1915) "along the beach near Avalon." She secured about a dozen species. The principal set is in herb. Rochester Academy of Sciences, with a duplicate series in herb. Field.

BETHEL, E(llsworth).

Collected—for one day only—in 1912, 1913, 1914 and 1915. His

plants, mostly fungi, are in the herbarium of the Colorado State Museum, Denver, Colo.

BISHOP, Dr.

Note of Mrs. Trask: "He collected *Marrubium vulgare* in the vicinity of Avalon, 1896." See *Erythea* 7:142.

BOUGHTON, Fred S.

Of Pittsford, N. Y., during a collecting tour in "the west," secured a few specimens on Catalina, but as he labeled his sheets simply: "Flora of the Western United States," the localities collected are doubtful. He remembers 9 species as of Catalina, duplicates of which are in herb. Field. His original series is in herb. Rochester Academy of Sciences.

BLAKE, S(idney) F(ay).

Of the U. S. Nat'l Herb. collected his numbers 966-970 in the vicinity of Avalon, Sept. 11, 1910. The plants are in his private herb.

BRANDEGEE, K(atherine) (Kate Curran).

See Brandegee, T. S. & Wife.

BRANDEGEE, T(ownshend) S(tith) & Wife.

Made quite an extensive collection in 1884, 1889, 1890, 1899, and May 17 to 25, 1916; they have no record of the full number of plants collected. The prime series of their earlier collections was destroyed in the Cal. Acad. Sci. fire; partial sets of duplicates are in herb. Field; herb. Gray; and herb. Univ. Calif. where their complete herbarium is now deposited.

[1] "The Plants of Santa Catalina Island." *Zoe* 1:107-115 (1890).

[2] "Flora of the California Islands." *Zoe* 1:129-148 (1890).

CARLSON, J(ohn) I(ngomar).

Collected a few plants on each of three visits to the island, in pursuit of herpetological investigations, on the 25-28 April, 1914; 13 June, 1915; and 10 May, 1918. The specimens are in the herb. Calif. Acad. Sci.

CHAMBERLAIN, L(eander) T(rowbridge).

We have been unable to secure data as to his collection.

CHASE, (Mrs.) (Mary) Agnes.

Spent a short part of one day on the island on April 14, 1910. She collected but four numbers (5560-5563) in the vicinity of Avalon. They are in U. S. Nat'l Herb. Div. Agrost.

DALL, W(illiam) H(ealey) & Baker, M(arcus).

Made a general natural history collection in the vicinity of Catalina Harbor, in Jan., 1874, in connection with the U. S. Coast Survey under Prof. B. Peirce, Supt. The material collected (including a few plants) is in the U. S. National Herbarium.

DAVIDSON, (Dr.) A(nstruther).

Made several short trips to Catalina and one of two weeks' duration, 1892 and 1895, the last of August and early September, 1893. On these trips he collected all species that appeared interesting in the light of his extended knowledge of Los Angeles County plants. His collections are in his private herb. at Los Angeles. A few duplicates are in the herb. of E. L. Greene, Notre Dame Univ.; and in the U. S. Nat'l Herb.

- [1] "New Records for Catalina Island," *Erythea* 2:30 (1894).
- [2] "Catalogue of the Plants of Los Angeles County" *So. Calif. Acad. Sci.* 1:1 (1896).
- [3] "New Plant Records for Los Angeles County" *Ibid.* 2:70 (1903).

EASTWOOD, Alice.

Spent six days on the island, July 20-25, 1917, mostly in the vicinity of Avalon; about the head of Gallagher's Canyon, and at the Isthmus. She collected 92 numbers (6442-6533) now in the herb. Cal. Acad. Sci., with a fair representation in herb. Gray and herb. Field.

- [1] "Notes on the Plants of St. Nicholas Island" *Proc. Cal. Acad. Sci.* 3:89-120 (1898), including Catalina Island references.

EISEN, (Dr.) (August) G(ustav).

Collected on Catalina in 1874. The extent of his collecting is unknown to us.

EVERMAN, B(arton) W(arren).

Collected a few plants while engaged in zoologic investigations, in March, 1918. The specimens are in herb. Cal. Acad. Sci.

FISHER, Geo(rge) L(ewis).

Collected a few specimens on the ridge above the School House, Avalon, June 16, 1920. The specimens exist in two complete series in herb. Field and U. S. Nat'l Herbarium.

FRITCHEY, J(ohn) Q(uincy) A(dams).

Collected a few plants on Mar. 30, 1889. His specimens are in herb. Mo. Bot. Gard.

GAMBEL, (Dr.) W(illiam).

The pioneer botanical collector of the island, Feb., 1847. While his plants are supposed to be deposited in the herb. Phila. Acad. Sci., yet the best labelled and fullest series (like those of Thos. Nuttall, who named them) is in herb. Durand, British Museum, London.

- [1] "Plants Collected by William Gambel, M.D., in the Rocky Mountains and Upper* California." Thos. Nuttall in *Jour. Acad. Nat. Sci., Phila.*, ns. 1:149 (1848).
- [2] "Description of Plants Collected by Mr. William Gambel in

*In contradistinction to Lower California (Mexico).

the Rocky Mountains and Upper* California." Thos. Nuttall in Proc. Acad. Nat. Sci., Phila. 4:7-26 (1850).**

GRANT, G(eorge) B(ernard).

Collected alone (1900, 1901, 1903) and with Walter Wheeler, April 21-26, 1904. The extent of the collection is not known to us. His prime series is in the herb. Stanford Univ., together with his complete private herbarium. Dupl. series are in herb. Calif. Acad. Sci., N. Y., Bot. Gard. and herb. Field.

HALL, H(arvey) M(onroe).

Collected, with Mrs. Trask as guide, in June, 1908, from White's Landing up Swain's Canyon to the Coach Road, and in the vicinity of Avalon. He secured 20 specimens (8270-8289). These plants are in herb. U. of Calif.

HASSE, (Dr.) H(ermann) E(dward).

This well-known California Lichenologist made many visits to Catalina (from 1888-1915), primarily in search of his favorite plants. During these he also collected such flowering plants as appeared of special interest to him. His most extended visits (a few days) were in July, 1888, and May, 1911. His collections are in herb. N. Y. Bot. Gard. and the Crypt. Herb., Cambridge, Mass.

His publications in which Catalina plants are represented are:

Bull. So. Cal. Acad. Sci.	2:23-26	Erythea	4:96-98
Bull. So. Cal. Acad. Sci.	2:32-35	Erythea	3:41-44
Bull. So. Cal. Acad. Sci.	2:58-60	Erythea	4:150-1
Bull. So. Cal. Acad. Sci.	2:71-73	Contrib. U. S. Nat'l.	
		Hb.	17:1-132
Bull. So. Cal. Acad. Sci.	2:52-54	Bryologist	15:45-48
Bull. So. Cal. Acad. Sci.	5:38-45	Bryologist	13:61
Bull. Torrey Club	24:445-9	Bryologist	14:100-2
		Bryologist	11:6-7

HELLER, A(mos) A(rthur).

Collected a few numbers on Catalina on two short visits, one in June, 1908. He is unable to give us the actual data of his work.

HOWLAND, Mrs.

Catalina specimens of *Phacelia hispida* Navarretia hamata, *Elisia chrysanthemifolia* and one of *Emmenanthe pend.* are credited to her by Brand. We have found no other data concerning her collecting.

JEPSON, W(illis) L(inn).

Collected on Catalina July 11-13, 1908, under the guidance of Mrs. Trask. His principal interest was an intimate study of *Lyonothamnus* and the various species of *Quercus*. He collected inciden-

*In contradistinction to Lower California (Mexico).

**This article is a contraction of the previous article in the Journal as indicated above.

tally 27 plants (3040-3066) which are now in the herb. Univ. of Calif., together with his Field Notes (Vol. 19:3-35) a copy of which he has kindly contributed to the herb. Field. His note book is particularly interesting and valuable in its record of conversations with Mrs. Trask, many of whose observations and remarks on Catalina plants he carefully preserved.

- [1] "Trees of California." (1909.)
- [2] "Flora of Western Middle California." (1901.)
- [3] "A Flora of California." (1909-1922.)

KENNEDY, P(atrick) B(everidge).

Collected in the vicinity of Avalon and at Moonstone Beach, April 21, 1907, especially in search of *Trifolium*. His specimens are in herb. U. S. Nat'l Museum.

- [1] "Studies in *Trifolium*." *Muhlenbergia* 9:29 (1913).

KINGMAN, C(hester) C(ole).

Collected for three weeks on Catalina in Aug., 1910. His specimens (principally mosses and Hepatics) are at present at his old home in Reading, Mass. A few duplicates are in U. S. Nat'l Herb.

- [1] "Notes on Hepaticae of Southern California." *Bryologist* 14:33-34 (1911).
- [2] "A list of Mosses collected in Southern California." *Bryologist* 15:93-95 (1912).

KNOFF, Ezra C(harles).

Began collecting on the island in March, 1921, and continued the work at such intervals from his business, in Avalon, as time permitted, until July 30, 1922. He visited all localities of rare finds, even to the western extremity of the island. His specimens are deposited in herb. Field Museum (Nos. 1-500).

[**LEMMON**, J. G.

While specimens of "Catalina" plants have been credited, in publications, to this indefatigable California collector, the only ones that we have seen and been able to trace are labeled "Santa Catalina Mts."—an Arizona station.]

LYON, W(illiam) S(crugham).

Collected on Catalina in June, 1884, with Nevin (the plants of this series of Nevin and Lyon bear no collecting numbers), and July to October, 1885 (this series in herb. Gray bear numbers 1 to 88+, with many species lacking numbers. There is no record of whether the enumeration is Lyon's or Dr. Watson's—probably Lyon's). He lists 151 species in the *Botanical Gazette* (see below). His prime set of plants is in the Gray Herbarium, Harvard.

- [1] "Flora of Our Southwestern Archipelago." *Bot. Gaz.* 11:197-205; *ibid.* 330-336, plant list 303-4 (1886).

MACBRIDE, J, Francis & **PAYSON**, E(dwin) B(lake).

Spent July 18-19, 1915, collecting on the island. Their stations

were: Hills West of Avalon (835-6); Hills and Beach East of Avalon (837-61); and the Isthmus (862-72). The prime set is in Gray Herbarium, Harvard, the second in the Rocky Mountains Herb., Laramie, Wyo.

McCLATCHIE, A(lfred) J(ames).

Spent ten days on the island in September, 1893. The full extent of his collection is not known to us. The prime set is in the herb. N. Y. Bot. Garden where McClatchie's complete herbarium is now deposited.

[1] "Additions to the Flora of Los Angeles County and Catalina Island."

I. *Erythea* 2:76-80.

II. *Erythea* 2:122-125.

[2] "Flora of Pasadena and Vicinity." Reed's Hist. of Pasadena (1895).

[3] "Seedless plants of Southern California." So. Calif. Acad. Sci. 1:337-398 & 341-395 (1897).

McCLATCHIE, Miss Anna Morrison.

Collected in 1894.

McGREGOR, E(rnest) A(lexander).

Spent some time in early February, 1921, searching for *Rocella tinctoria* for commercial purposes. During his search he collected 23 species of lichens now deposited in the U. S. Nat'l Herb.

MERRITT, Alice J(ane) (Mrs. Anstruther Davidson).

Collected about 50 plants, in the vicinity of Avalon, in April, 1894. The collection is now in the herb. of Dr. A. Davidson, Los Angeles, Calif.

MILLER, C. E. (Mrs.)

Lived at Avalon and was interested in Natural History. The extent of her collection is not known to us. A few specimens collected in 1918 are in the herb. Calif. Acad. Sci. Mr. Brandegee thinks that she had no herbarium.

MILLER, Dr. Gerritt S. Jr.

Collected in 1921 a specimen of *Opuntia* (for Dr. Rose) in the vicinity of Avalon. Specimen in U. S. Nat'l. Herb.

MILLSPAUGH, C(harles) F(rederick).

Spent part of two days (Dec. 4-5, 1919) collecting about Avalon and Hamilton Canyon. Returned to the island Jan. 1, 1920, and collected there daily until April 3d, during which time he visited and revisited (from bases at Avalon and the Isthmus) nearly all the stations described in this Flora. His collection (4463-4481 & 4494-4913) is in herb Field.

MOXLEY, George L(oucks).

Collected on Catalina May 6-7, 1919 (688-728); May 1-2, 1920

(731-753), principally in the vicinity of Avalon. His specimens are in the herb. Los Angeles County Historical Museum, with duplicates in herb. Field.

NEVIN, (Rev.) J(oseph) C.

Collected with Lyon, 1884.

NORRIS, R(obert) S(tewart).

Collected a few specimens on Catalina in June, 1893, while a student under Prof. E. L. Greene. His plant collecting was incidental to other work. The specimens are in herb. Univ. of Calif.

NUTTALL, L(awrence) W(illiam).

Began collecting on Catalina April 27, 1920, and continued until October; then intermittently until February 10, 1921. During his work he covered all the stations mentioned on the previous pages of this Flora, revisiting each several times as the season advanced. His specimens (1-1250) are deposited in herb. Field.

PALMER, Dr. Edward.

Issued at set of plants labelled "Santa Catalina Island" and dated Aug. 16, 1888. The collecting numbers (?250-256?) run with those of his San Diego and Guadaloupe Island plants of that year. On some sheets a separate number is pasted which doubtless represents his Catalina series of about 12 plants, deposited in the U. S. Nat'l Herb.

PARISH, S(amuel) B(onsall).

Collected in the vicinity of Avalon and at Pebble Beach, March 31, 1916. He took only sixteen specimens (10,749-10,763) of plants that appeared unusual in the light of his large acquaintance with the plants of Los Angeles County. His specimens, together with his entire private herbarium, are now in herb. Stanford University.

[1] "A Sketch of the Flora of Southern California." Bot. Gaz. 36:263-5 (1903).

[2] "Southern Extension of *Polypodium Scouleri*." Fern Bul. 9:40.

PAYSON, E(dwin) B(lake).

(See Macbride & Payson.)

PENDLETON, Rob(er)t L(arrimore).

Collected 87 plants (1350-1436) in the vicinity of Avalon, Pebble Beach, Moonstone Beach, and the Isthmus, July 1-10, 1909. He was accompanied by Fred M. Reed. Pendleton's series of specimens is in the herbarium of the University of California where some labels on the sheets are headed "Pendleton & Reed;" these, however, bear Pendleton's numbers, not Reed's. Duplicates of about one-half his plants are in herb. Field.

POLLAY, Harry.

Lived at Avalon. He collected a number of plants in 1889-1891. A few of his plants are in the U. S. Nat'l Herbarium.

REED, Fred(erick) M(orris).

Collected, in company with Pendleton and at the same stations, about 100 plants, July 2-7, 1909 (? 2748-2859 ?). Each collector maintained his own series of numbers. Reed's plants are in the herb. Univ. of California. A few duplicates in herb. Field.

RIXFORD, G(ulian) P(ickering).

Collected in the vicinity of Avalon, May, 1914. The extent of his collecting is unknown to us. His plants are in the herb. Calif. Acad. Sci.

RUSBY, H(enry) H(urd).

Collected a few plants, incidentally, in the vicinity of Avalon, Aug. 17, 1915. His specimens are in herb. N. Y. Botanical Garden.

SANFORD, O. S.

A conchologist of San Diego, Calif., collected a few plants on Catalina from 1880-1885.

SARGENT, C(harles) S(prague).

Spent about three days on Catalina in September, 1894, observing and collecting woody plants. The extent of his collection is not known to us or remembered by him. The specimens are in the herb. Arnold Arboretum, Boston.

SCHUMACHER, P(aul).

Collected on Catalina, June, 1878. His specimens are supposed to be in herb. Gray, though we have failed to find any there.

SMILEY, Frank J(ason).

Collected during "four or five days" in June, 1919. His stations were Rock Falls Canyon; Pebble Beach; along the Coach Road and from Summit down Gallagher's Canyon to the beach. His collections are in his private herbarium.

SMITH, Huron H(erbert).

Spent about 5 weeks on the island from May 26 to July 4, 1912. Most of his time was expended in photographing and collecting dendrological material. He also collected 142 numbers for herbarium purposes as follows: Vicinity of Avalon (4972-5007); Avalon Valley (5068-5076); valley-end trails up to 1200 feet altitude (5008-5032); Pebble Beach Road (5033-5067); Pebble Beach Canyon (5080-5098); Rock Spring Canyon (5099-5106), (5163-5166); Summit (5077-5079, 5167-5168); Hay Press and Middle Ranch Canyon (5110-5121); Silver Canyon (5107-5109); White's Beach Valley (5169-5173); Swain's Canyon (5174). His specimens are deposited in herb. Field where also may be seen his excellent photographs and dendrologic material.

TOUMEY, J(ames) W(illiam).

Collected three days with Prof. Sargent in Sept., 1894. His few

specimens, principally woody plants, are now in U. S. Nat'l Herb. and herb. Univ. of Arizona.

TRASK, (Mrs.) (Luella) Blanche.

Mrs. Trask lived on the island from 1895-1907, spending the winter months at Avalon and the summer at Fisherman's Cove, near the Isthmus. She was an indefatigable pedestrian and thought little of walking over the ridge trail from Avalon to the Isthmus and back in a day, or even making the trip one way in the night. During her residence she not only "became acquainted with each individual tree on the island and knew of every spring and canyon far more intimately than the shepherds or any Native," but collected and distributed both botanical and ethnological specimens in great quantity. She died in San Francisco, Nov. 11, 1916. Her prime plant collection was destroyed (except the types) in the disastrous fire that visited the California Academy of Sciences and her private herbarium in the great fire at Avalon, Nov. 29, 1915. Fortunately her duplicates, in part at least, are to be found in other herbaria. In the herbarium of the New York Botanical Garden her plants are mostly those of 1900-1, though the dates range from 1895-1916; in the U. S. National Herbarium there are about 500 sheets (principally San Nicholas and San Clemente) and the specimens are more ample; in the Herb. Gray a few Catalina sheets are to be found, but the series is principally San Clemente; a number of her more interesting specimens were saved from the California Academy fire and are in the herbarium of the new building of that Society; the herbarium of the Field Museum contains 301 of her Catalina plants.

- [1] "Field Notes from Santa Catalina Island." *Erythea* 7:135-146 (1899). Mentions 105 species of interest as to growth or attractiveness.
- [2] "The Heart of Santa Catalina." *Land of Sunshine*, Sept., 1897.
- [3] "Flora of San Clemente Island." *Bull. So. Calif. Acad. Sci.* 3:90-95 (1904). Mentions many Santa Catalina plants.

WALLACE, William A.

Collected on the island about 1854. His specimens were sent to Dr. Gray and are now in Gray Herbarium, Harvard.

WALPOLE, F(rederick) A(ndrews).

A brilliant botanical artist, associated with the U. S. Dept. Agric. made color plates of *Ribes viburnifolium* and collected a fine series of herbarium specimens of that species for the U. S. Nat'l Herbarium in February, 1904.

WHEELER, (Mrs.) S. A. P.

Resided continuously at Avalon for a number of years previous to 1897, during which time she was particularly interested in botany and acted as guide or advisor to most of the visiting collectors of that period. We have not been able to secure data concerning her collections.

WHEELER, Walter.

(See Grant & Wheeler.)

[WOOTON, E. O.]

Specimens have been quoted as collected by him on Catalina Island. He informs us that he never collected there. The specimens mentioned have been misinterpreted. They doubtless bore the label "Santa Catalina," meaning the mountains of that name in Arizona.]

PUBLICATIONS OF CATALINA SPECIES BY OTHERS THAN COLLECTORS THERE:

"A Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs." LeRoy Abrams, Bull. N. Y. Bot. Gard. 6:300-485 (1910).

"Insular Floras." Lorenzo G. Yates in Ninth Ann. Rep. State (Calif.) Minerologist, pp. 11-20.

"Ferns of the Channel Islands." Lorenzo G. Yates, Bull. Sta. Barbara Soc. Nat. Hist. 1, 2:8-10.

"New Fungi from Catalina Island." J. B. Ellis and B. M. Everhart. So. Calif. Acad. Sci. 4:62-3 (1905).

In the preparation of this work the senior author visited the herbaria of the Univ. of Calif.; Calif. Acad. Sci.; Stanford Univ., Harvard Univ.; New York Bot. Gard.; and the U. S. Nat'l Herb. At all of these institutions he was granted the privilege of examining the Catalina material deposited in each. For this and other courtesies he wishes to record his sincere thanks to Profs. H. M. Hall and W. L. Jepson and to Miss Harriett Walker; Prof. LeRoy Abrams; Miss Alice Eastwood; Profs. B. L. Robinson and Roland Thaxter; Dr. N. L. Britton and Messrs. F. W. Pennell and Percy Wilson; Mr. William R. Maxon; Dr. J. N. Rose and William Paul Standley.

Later he also visited the herbaria at Kew and the British Museum, London, where, through the kindness of Dr. A. W. Hill, and Mr. A. R. Rendle, he examined the Gambel plants deposited by Thomas Nuttall.

The various specialists who have contributed to the completeness of this Flora are credited each under the group upon which he so willingly worked.

SUMMARY

	Gen.	Sp.
SPERMATOPHYTA	257	455
PTERIDOPHYTA:		
Ferns	5	9
Equisets	1	2
Lycopods	1	1
BRYOPHYTA:		
Mosses	16	28
Liverworts	6	8
THALLOPHYTA:		
Fungi	133	213
Lichens	40	166
Total	459	882

THE FLORA

All plants may be grouped under four great categories known as Phyla or Sub-kingdoms, as follows:

Flowering plants:

Producing seeds.

Phylum A. SPERMATOPHYTA.

Flowerless plants:

Ferns and fern allies.

Phylum B. PTERIDOPHYTA.

Mosses and moss allies.

Phylum C. BRYOPHYTA.

Algae, Fungi, Lichens and allies.

Phylum D. THALLOPHYTA.

Phylum A. SPERMATOPHYTA.

Plants producing seeds which contain an embryo formed of one or more rudimentary leaves (Cotyledons), a stem, a root and a terminal bud. The essential organs consist of a pistil composed of an ovary containing one or more ovules; a style, sometimes rudimentary, tipped by a stigma or having a receptive surface known as the stigma: and certain male organs known as stamens composed of a stem (not always present) called the filament, an enlarged tip called the anther, and its contents the pollen. Biologically the ovary contains an embryo-sac (macrospore) which develops the minute female prothallium, an archegone of which is fertilized by means of a tube or male prothallium issuing from the pollen-grain (microspore) developed within the anther-sacs (microsporanges).

The spermatophyta are divided into two Classes as follows:

Stigmas 1 or more:

Ovules and seeds in a closed cavity (ovary).

Class 1. ANGIOSPERMÆ.

Stigmas none:

Ovules and seeds borne on the face of a scale.

Class 2. GYMNOSPERMÆ.

(No plants of Class 2 have been found on the island).

Class 1. ANGIOSPERMÆ.

Ovules enclosed in a cavity, the ovary, developed by the infolding and uniting of the margins of a modified and rudimentary leaf, the carpel; or of several such leaves joined together, in which the seeds are ripened. The pollen-grains on coming in contact with the summit of the carpel, the stigma, germinate by sending out a pollen-tube which penetrates the stigmatic tissue to reach an ovule an orifice of which (micropyle) it enters its tip coming in contact with a germ-cell in

the embryo-sac causing fertilization. In a few instances in this class the pollen-tube enters the ovule at the chalaza, not at the micropyle.

This class is divided into two sub-classes, as follows:

Cotyledon 1. Stem endogenous. Sub-class 1. MONOCOTYLEDONES.

Cotyledons normally 2; Stem normally exogenous. Sub-class 2. DICOTYLEDONES.

Sub-class 1. MONOCOTYLEDONES.

Embryo with a single cotyledon and the first leaves of the germinating plantlet alternate. Stem composed of a mass of soft tissue in which the bundles of wood-cells are irregularly imbedded. There is no distinction as to wood, pith, and bark. Leaves usually parallel-veined, mostly alternate and entire, commonly sheathing the stem at their base and often showing no distinction of blade and petiole. Flowers mostly 3-merous or 6-merous.

This sub-class is divided into Orders as follows:

*Carpels 1 or more, distinct (in this Flora); parts of the usually imperfect flowers mostly unequal in number.

Flowers not in the axils of chaffy scales:

Endosperm mealy or sarcous:

Perianth of bristles or chaffy scales. Order 1. PANDANALES.

Endosperm none or very little:

Perianth of 4 rudimentary sepals. Order 2. NAIADALES.

Flowers in the axils of dry, chaffy scales: Order 3. POALES.

**Carpels united into a compound ovary; parts of the flower usually complete, mostly in 3s or 6s.

Perianth well developed.

Endosperm fleshy or horny. Order 4. LILIALES.

Endosperm mealy; ovary mostly superior. Order 5. XYRIDALES.

Order 1. PANDANALES.

Our species aquatic or marsh plants with narrow, elongated leaves and very small, imperfect and incomplete flowers in spikes or heads. Perianth of bristles or of chaffy scales. Ovary 1, 1-2-celled. Endosperm mealy or fleshy.

Family 1. TYPHACEÆ.

CAT TAIL FAMILY

Marsh or aquatic plants with creeping rootstocks, fibrous roots and glabrous, erect, terete stems. Leaves ensiform, linear, flat, striate, sheathing at the base. Flowers monoecious, densely crowded in terminal spikes which are subtended by spathaceous, usually fugaceous bracts and divided at intervals by smaller caducous bracts, the staminate spikes uppermost. Perianth of bris-

ties. Stamens 2-7, the filaments connate; ovary 1, stipitate 1-2-celled. Ovules anatropous. Styles as many as the cells of the ovary. Mingled with the stamens and pistils are bristly hairs and among the pistillate flowers many sterile flowers with clavate tips. Fruit nutlike. Endosperm copious.

I. TYPHA Linn.

Characters of the family as above.

Fruit pedicels 1 mm. or less,

Fruiting rachis 3-4 mm. thick.

Fruit pedicels 2-3 mm.

Fruiting rachis 8-11 mm. thick.

1. *angustifolia*.

2. *latifolia*.

1. *T. angustifolia* Linn. Sp. Pl. 971 (1753).

Typha bracteata Greene, Bull. Calif. Acad. 2:413 (1887).

Stem slender, 1-4 m. tall. Leaves narrowly linear, 2-20 mm broad. Racemes light or dark brown the staminate and pistillate portions usually separated by a small interval; each 1-4 dm. long; pistillate portion with bractlets 0.5-2 cm. diam. Stigmas linear or oblong-linear. Hairs accompanying the pistillate flowers with or without club-shaped tips. Pollen-grains simple. Denuded rachis of the mature pistillate raceme slender, 3-4.5 mm. thick, roughened by the short, rigid pedicels which are 1 mm. or less in length.

In permanent moisture of the deeper cañons and low places on uplands. May to July. Rock Spring Cañon, *Mills* 436; Soap Stone Quarry, *Nuttall* 906.

2. *T. latifolia* Linn. Sp. Pl. 971 (1753).

Stems stout, 1-2.7 m. tall. Leaves linear, 6-25 mm. broad. Racemes dark-brown or blackish the staminate and pistillate portions usually contiguous, each 8-20 cm. or more long; pistillate portion without bractlets, 2-3.5 cm. diam. Stigmas rhomboidal or spatulate. Pollen-grains in 4s. Denuded rachis of the mature pistillate raceme stout, 8-11 mm. thick, conspicuous by the long, bristle-like, persistent pedicels which are sometimes 3 mm. in length.

In permanent wet places. May to June. Typha Cañon, *Nuttall* 307; Hamilton Canyon, *Knopf* 40. CAT-TAIL.

Order 2. NAIADALES.

Aquatic or marsh herbs with or without stems and with short or elongated rootstocks. Leaves alternate or opposite, flat or terete above the stipular base; blades narrow or broad, usually entire rarely toothed, or wanting, the phyllodia various in shape. Flowers perfect

or unisexual and the pistillate ones rarely dimorphous, solitary or clustered in the leaf-axils, or spirally arranged in a spike or borne on a unilateral spadix. Perianth single or double, but imperfect, or obsolete or wanting. Androecium of 1-4 stamens; filaments very short or obsolete; anthers mostly 2-4-celled, usually with large, sometimes petaloid, connectives. Gynoecium of a single carpel, or of 2-several distinct or united carpels. Ovary superior; style present or wanting; stigma disk-like, cup-like or elongate. Fruit nutlets, drupelets or utricular.

Family I. **ZOSTERACEÆ.**

EEL-GRASS FAMILY.

Perennial marine plants with creeping rootstocks and flattened branching stems. Leaves all alternate, 2-ranked, linear, flat or complicate, sheathing at the base. Flowers monoecious or dioecious, arranged on a one-sided spadix and enclosed in a close-fitting, ultimately rupturing spathe. Perianth none but some of the flowers covered by a hyaline envelope. Staminate flower of a single, sessile, 1-celled anther. Pistillate flower of two united carpels with a short or elongate style and 2 thread-like stigmas. Seeds ribbed or smooth. Embryo ovoid or ellipsoid.

I. **PHYLLOSPADIX** Hook.

Submerged salt-water perennials. Stems slender, much branched. Leaves linear, grass-like, with a sheathing base. Inflorescence a peduncled 1-sided spadix enclosed in a sheathing spathe which splits at maturity. Flowers dioecious, arranged in 2 rows on the spadix each flower covered by a hyaline envelope. Perianth none. Staminate flower of a single, sessile, 1-celled anther. Pistillate flower with sessile carpels. Style short crowned by 2 capillary stigmas. Mature fruit coriaceous, indehiscent, crowned by short style at the apex and deeply cordate-sagittate at the base. Seeds membranous, globose, not sulcate.

I. **P. Torreyi** S. Wats. Proc. Am. Acad. 14; 303 (1879).

Stems simple or branched, flat, 3 dm. or more long. Leaves all submerged, linear, flat when juvenile complicate or truly terete when mature, 0.8-2 m. long, 0.7-1.5 mm. wide, obtuse or acute, sheathing. primary nerves 1-3 or sometimes the blade nerveless. Inflorescence a curved or straight spadix, the spathe mostly enclosing the flowers

and splitting after anthesis; peduncles cauline, mostly branched, in 2s or 3s, mostly 3-14 cm. long and with numerous fugaceous bracts; bracts scarious, obtuse or acute, 1-3.5 cm. long. Staminate flowers numerous, in 2-rows, consisting of sessile, 1-celled anthers. Pistillate flowers of sessile ovaries. Mature fruit 1-seeded, flask-shaped, 2-3 mm. long, beaked by the persistent style at the apex, deeply cordate-sagittate at the base, with 2 projecting wings and sometimes winged on the back. Seeds reddish.

Maritime, from low tide to 2 fathoms. June to July. *Brandegee*.

Order 3. POALES.

Grasses and sedges. Monocotyledonous plants, mostly herbaceous, with leafy or leafless, usually simple, stems (culms), the leaves usually narrow and elongated, entire or minutely serrulate. Flowers mostly perfect, small, incomplete, in the axils of dry, chaffy scales (glumes) arranged in spikes or spikelets.

Fruit a caryopsis (grain); culm mostly hollow. Fam. 1. POACEAE.
Fruit an achene; culm solid. Fam. 2. CYPERACEAE.

Family 1. POACEÆ.*

GRASS FAMILY.

Annual or perennial herbs, of various habit, rarely shrubs or trees. Culms (stems) generally hollow, but occasionally solid, the nodes closed. Leaves sheathing, the sheaths usually split to the base on the side opposite the blade; a scarious or cartilaginous ring, naked or hairy, rarely wanting, called the ligule, is borne at the orifice of the sheath. Inflorescence spicate, racemose or paniculate, consisting of spikelets composed of two to many 2-ranked imbricated bracts, called scales (glumes), the two lowest in the complete spikelet always empty, one or both of these sometimes wanting. One or more of the upper scales, except sometimes the terminal ones, contains in the axil a flower, which is usually enclosed by a bract-like awnless organ called the palet, placed opposite the scale and with its back toward the axis (rachilla) of the spikelet, generally 2-keeled; sometimes the palet is present without the flower, and vice versa. Flowers perfect or staminate, sometimes monoecious or dioecious, subtended by 1-3 minute hyaline scales called the lodicules. Stamens 1-6, usually 3. Anthers 2-celled, versatile. Ovary 1-celled, 1-ovuled. Styles 1-3, commonly 2 and lateral. Stigmas hairy or plumose. Fruit a seedlike grain (caryopsis). Endosperm starchy.

*By A. S. Hitchcock.

- *Spikelets in pairs in racemes aggregated in a dense inflorescence. Rachilla articulated below the glumes—*Andropogonae*. 1. ANDROPOGON.
- **Spikelets 3-flowered. Rachilla articulated above the glumes—*Phalarideae*. 2. PHALARIS.
- ***Spikelets 1-flowered. Rachilla sometimes prolonged behind the palea as a naked bristle—*Agrostideae*.
- Lemmas indurated, awn trifid. 3. ARISTIDA.
awn simple. 4. STIPA.
- Lemmas membranaceous:
- Awned or mucronate from the tip. 5. MUHLENBERGIA.
Glume long-awned. 6. POLYPOGON.
Glume awnless or short-awned:
- Saccate at the base. 7. GASTRIDIMUM.
Not saccate at the base. 8. AGROSTIS.
- ****Spikelets 2 or several, in open panicles—*Aveneae*.
Awns dorsal. Lemmas more than 12 mm. long. 9. AVENA.
- *****Spikelets, 1-several flowered in one-sided digitate spikes—*Chlorideae*. 10. CAPRIOLA.
- *****Spikelets 2-many-flowered, pedicels in racemes or contracted panicles—*Festucæ*.
- Spikelets of two kinds in the inflorescence. 11. ACHYRODES.
Spikelets alike in the inflorescence:
- Plants dioecious.
- Spikelets solitary. 12. MONANTHOCHLOE.
Spikelets in exserted panicles. 13. DISTICHLIS.
- Plants not dioecious (except a few Poas):
- Lemmas 3-nerved: 14. DISSANTHELIUM.
Lemmas 5-many nerved:
- Keeled and awnless. 15. POA.
Keeled only at summit:
- Glumes scarious margined. 16. MELICA.
Glumes not scarious margined:
- Lemmas entire. 17. FESTUCA.
Lemmas bifid at apex. 18. BROMUS.
- *****Spikelets 1-several-flowered, sessile, on opposite sides of a flattened or channelled rachis: in a spike.—*Hordeae*.
- Spikelets solitary at each joint:
- Edgewise to the rachis. 19. LOLIUM.
Flatwise to the rachis. 20. PHOLIURUS.
- Spikelets 2 or 3 at each joint:
- Spikelets 1-flowered. 21. HORDEUM.
Spikelets 2-6-flowered:
- Axis of spike continuous:
- Not disarticulating in maturity. 22. ELYMUS.
Disarticulating at maturity. 23. SITANION.

**Panicoideae*—Spikelets with one perfect flower or with a second staminate or neutral flower below. Rachilla articulated below the glumes, the more or less dorsally compressed spikelets falling from the pedicels entire, singly, in groups or together with joints of an articulate rachis.

Andropogoneae—Spikelets in pairs (or the terminal in threes) one sessile, or nearly so and fertile, the other pedicelled. Lemmas hyaline.

1. ANDROPOGON Linn.

Spikelets in pairs (or the terminal in 3's) at each joint of the

articulate and usually hairy rachis, one sessile, perfect, 1-flowered, the other pedicellate, staminate, neutral or reduced to a pedicel. Glumes of fertile spikelet 2, the first more or less indurated, flattened on the back with 2 prominent nerves near the margin the central less prominent, the second glume as long as the first, keeled. Sterile and fertile lemmas hyaline the latter awned. Petals minute or wanting. Annual or perennial usually coarse grasses with terminal and often axillary inflorescence of one to many spikes.

1. **A. saccharoides** Swtz. Prodr. Veg. Ind. Occ. 26 (1788).

Andropogon barbinodis Lag. Gen. & Sp. Nov. 3 (1916).

Culms tufted erect or somewhat spreading at the base, 6-12 dm. high, glabrous except the densely-ascending-hispid nodes; sheathes glabrous; blades 3-6 mm. wide, flat, scabrous above, the upper much reduced; panicle 5-7.5 cm. long consisting of several appressed or ascending silky-white racemes somewhat flabellately aggregated near the summit of the culm; glumes of the sessile spikelet 5 mm. long, awn about 2 cm. long, geniculate at the middle, tightly twisted below the bend, loosely twisted above.

Dry hillsides and roadsides. *Trask*; slopes near Avalon, *Davidson*; between Cherry Valley and Howland's Landing, *Mills* sp. 4810, *Knopf* 194;

****Poacoideae**—Spikelets 1-many flowered, the imperfect or rudimentary floret if any, uppermost (or if below the fertile one then the spikelet strongly laterally compressed); rachilla usually articulated above the glumes; these persistent on the pedicel or rachis after the fall of the florets; spikelets more or less laterally compressed.

Phalarideae—Spikelets with one terminal perfect floret and a pair of sterile florets below the group articulated above the glumes and falling entire; sterile florets sometimes staminate but usually small or reduced to mere rudiments or pedicels.

2. PHALARIS Linn.

Spikelets with one perfect flower, laterally flattened. Glumes equal, scaphoid, exceeding the florets. Sterile lemmas 2, small and narrow, appearing like hairy scales attached to the fertile floret. Fertile lemma indurated and shining in fruit enclosing a faintly 2-nerved palea. Annuals or perennials with flat blades and dense, spike-like panicles.

Spikelets single, all alike. Annuals:

Glumes broadly winged.

1. minor.

Glumes wingless or nearly so;

Acuminate, turgid, apex smooth.

2. Lemmoni.

Acute, less turgid, apex villous.

3. caroliniana.

1. **P. minor** Retz. Obs. Bot. 3:8 (1783).

Annual; culms erect 3 dm. to 0.9 m. high; panicle ovate-oblong to oblong, 1.25-5 cm. long; glumes oblong, 2.6 mm. long, strongly winged on the keel which has a green stripe on each side; wing scabrous on the margin and more or less toothed; fertile lemma ovate, acute, villous, about 1.5 mm. long; the sterile lemma solitary, about 1 mm. long.

Lower levels near the sea. At Avalon, *Trask*; *Mills* sp. 4913. Fields at the Isthmus, *Nuttall* 224, 643. Reported as *P. canariensis* L. by *Brandegee*.

2. **P. Lemmoni** Vasey, Contr. Natl. Herb. 3:42 (1892).

Annual, culms erect, 3-9 dm. high; panicle dense, 5-10 cm. long; glumes about 5 mm. long, narrow, acuminate, the lateral nerves about midway between margin and keel; fertile lemma ovate-lanceolate, acuminate, dark-colored at maturity, villous except the acuminate tip, 3.5 mm. long; sterile lemmas less than one-third as long.

Lower lands near the sea shore at Avalon, rare *Trask*.

3. **P. caroliniana** Walt. Fl. Carol. 74 (1788).

Annual, culms erect, 3-6 dm. high; panicle oblong, 2.5-5 cm. long; glumes 5-6.5 mm. long, oblong, rather abruptly narrowed to an acute apex, the keel scabrous and narrowly winged above from below the middle, the lateral nerves about midway between keel and margin; fertile lemma ovate, acute, densely villous, about 2 mm. long; the close-appressed sterile lemmas about one-third as long.

Rare and apparently introduced from the Southeastern States. Avalon, along a cañon stream (1897), Mar. (1901) and (1891), *Mrs. Trask*.

****Agrostideae*—Spikelets 1-flowered, the rachilla sometimes prolonged behind the palea as a naked or plumose bristle; glumes usually as long or longer than the lemma.

3. **ARISTIDA** Linn.

Spikelets 1-flowered, in narrow or open panicles. Glumes narrow, acute, acuminate or short-awned. Lemma with a hard, obconical, pubescent callus, somewhat indurated, convolute, including the thin palea, terminating in a usually trifid awn. Tufted annuals or perennials with a narrow blade.

1. **A. adsensionis** Linn. Sp. Pl. 82 (1753).

Aristida bromoides HBK. Nov. Gen. et. Sp. 1:122 (1816).

Annual. Culms much branched at base, 1-3 dm. long, erect or often spreading or prostrate; blades 2.5-5 cm. long, narrow, usually involute; panicle narrow, rather dense, 5-7.5 cm., the branches short, fascicled; glumes unequal, smooth except the keel of the first, 1-nerved. The first 3-6 mm. long, acutish, the second 7-9 mm. long,

obtuse or slightly mucronate; lemma 8-10 mm. long, smooth except the upper portion of the keel, the callus with a dense tuft of short hairs, the apex scarcely narrowed; awns equal, finally spreading, about 1 cm. long or the lateral sometimes shorter.

Open ground. *Brandegee*, May 16 (1890), also his No. 56 collected on the same date (both in hb. U. S.); on a clayey bank, Fourth o' July, *Mills* sp. 4795. THREE-BARBED GRASS.

4. STIPA Linn.

Spikelets 1-flowered, in terminal open or narrow panicles. Glumes narrow, acute or bristle-tipped. Lemma with a bearded, sharp-pointed callus, pubescent, indurated, convolute, including the small palea, terminating in a simple, usually stout, geniculate, twisted awn. Rather coarse, tufted perennials with narrow or involute blades.

Awn not plumose;

Terminal segment about 6.25 cm. long.

Terminal segment about 2 cm. long.

1. *pulchra*.

2. *lepid*a.

1. *S. pulchra* Hitchc. Am. Jour. Bot. 2: 301 (1915).

Stipa setigera Presl. of various Calif. references.

A caespitose perennial; culms scaberulous or smooth, pubescent below the nodes, mostly 6-10 dm. high; sheathes smooth or scaberulous; ligule truncate, 2-3 mm. long or shorter on the innovations; blades flat or soon involute, 1-4 mm. wide, pilose above, scaberulous beneath; panicle open, 1-3 dm. long, the main axis smooth or scaberulous, the branches slender, scaberulous, ascending or spreading, somewhat flexuous, mostly in pairs, naked below, the lower 8-15 cm. long, sometimes pubescent around the axils; spikelets loosely clustered toward the ends of the branches, the branchlets slender, the ultimate lateral pedicels 2-3 mm long; glumes nearly equal, usually purple, attenuate-pointed, about 15 mm. long, the lower 3-nerved, the upper 5-nerved; lemma oblong, including the narrow, sharp, pilose callus 8-10 mm. long, pubescent in lines from below to about the middle, or somewhat pubescent all over, the surface minutely tuberculate, the apex somewhat constricted into a neck with a ciliate edge of erect hairs; awn 6-8 cm. long, twice geniculate, appressed pilose to the first bend, scabrous above, the terminal segment slender and flexuous.

Open situations. *Lyon* and *Brandegee* lists. In scattered tufts on silt soil, Echo Lake, *Knopf*, 7, 201;

2. *S. lepid*a Hitchc. *ibid* 302.

Stipa eminens Cav. of various Calif. coast references.

A caespitose perennial; culms erect, smooth or scaberulous, pubescent below the nodes, 5-8 dm. high; sheathes smooth or scaberulous or sometimes a little pubescent, more or less villous at the mouth; ligule a narrow membrane about 0.5 mm. long, blades flat,

more or less involute in drying, 1-3 dm. long, 1-4 mm. wide, pubescent above, smooth or scaberulous beneath; panicle loose, 10-13 cm. long, the axis smooth or scaberulous, the branches single or in pairs or the lower sometimes in threes, spreading, scabrous, slender, naked below, sometimes pilose in the lower axils, the lower nodes distant; spikelets pale or purplish, clustered on the upper half or two-thirds of the branches, the branchlets appressed; glumes thin, narrow, gradually acuminate, slightly unequal, the lower 7 mm. long, 3-nerved, the upper 3-nerved or faintly 5-nerved; lemma about 5-nerved, pilose on the callus, rather sparsely pubescent all over or glabrate above, narrowed toward the apex but with no distinct neck, the inconspicuous crown minutely ciliate; awn mostly 2.5-3.5 cm. long, very slender, minutely appressed pubescent below or nearly glabrous, scabrous above, twice geniculate, the bends often indistinct, the terminal segment somewhat flexuous.

Open situations. *Brandegee* 59 (1890); on a sandy level of the arroya of Gallagher's Cañon, *Millsp.* 4868.

***Stipa lepida Andersoni* (Vasey) Hitchc, *ibid* 303.**

Stipa eminens Andersoni Vasey, Contrib. U. S. Natl. Herb. 3:54 (1892).

Differs in being smaller and in having narrower and fewer-flowered panicles and somewhat smaller spikelets.

Hillside and bluffs. Bluff facing the ocean at Pebble Beach, and hillside of Cañon opposite Chicken Johnny's. *Nuttall* 115, 336; Sugar Loaf, *Pendleton* 1384. FEATHER GRASS.

5. MUHLENBERGIA Schreb.

Spikelets 1-flowered. Glumes thin, 1-nerved, often aristate. Lemma with a short, often barbate callus, narrow, membranaceous, 3-nerved, acute, mucronate or often awned from the tip or from between the teeth of the bidentate apex. Palea thin, about as long as lemma. Annual or usually perennial grasses, the inflorescence varying from an open and diffuse, to a narrow and spike-like, panicle.

1. ***M. microsperma* Trin. Gram. Unifl. 193 (1824) (by inference only).**

Muhlenbergia purpurea Nutt. as to Gambel's specimen.

Muhlenbergia gracilis Trin. of Brandegee's list (See Parish, *Zoe* 5:112.

Annual, often purple; culms spreading, 1.5-3.5 dm. high, scaberulous especially below the nodes; sheathes smooth or scaberulous; ligule 1 mm. long; blades 2.5-5 cm. long, 1 mm. wide, flat, scabrous; panicles narrow, loose, 2.5-7.5 cm. long; glumes ovate, obtuse or emarginate, 1-nerved, unequal, the second the longer, 1 mm. long;

lemma narrow, acuminate, 3-nerved, 3 mm. long, appressed-pubescent on margins and callus; awn terminal, capillary, 10-15 mm. long. Cleistogamous spikelets are developed at the base of the lower sheaths. These are solitary or few in a fascicle in each axil, each spikelet included in the indurated, thickened, tightly rolled porophyllum. The glumes are wanting and awn of the lemma reduced, but the grain is larger than that of the spikelets in the terminal inflorescence, being about the same length (1 mm.) but much thicker. The porophyllum enclosing the spikelet is narrowly conical and readily disarticulates from the plant at maturity.

Open situations. *Gambel*; Avalon, *Mrs. Trask* G12 and March (1901); *Brandegee*; Howland's Landing, *Mills* 4818; Equestrian Trail, Alt. 600 ft., *Nuttall* 323, 729. DROPSEED GRASS.

6. POLYPOGON Desf.

Spikelets 1-flowered, in dense terminal panicles. Glumes 2, ending in a long slender awn. Lemma much shorter than the glumes, hyaline, short-awned. Annual or perennial, spreading, weedy grasses, with flat blades and bristly panicles.

Awns 1-3 mm. long, panicle somewhat lobed.

Awns 7-10 mm. long, panicle compact.

1. *lutosus*.

2. *monspeliensis*.

1. *P. lutosus* (Poir) Hitchc. Bull. U. S. Dept. Agr. 772:138 (1920).
Agrostis lutosa Poir. Encycl. Suppl. 1:249 (1810).
Polygopon littoralis Smith Comp. Fl. Brit. 13 (1800).

Perennial; culms geniculate at base, 3-6.5 dm. high; sheaths scabrous; ligule 2-4 mm. long or the uppermost longer; panicles oblong, 5-15 cm. long, more or less interrupted or lobed; glumes equal, scabrous on back and keel, 2-3 mm. long, terminated by an awn as long; lemma smooth and shining, 1 mm. long, minutely toothed at the truncate apex; awn about as long as the glume. Introduced from Europe.

Waste grounds of moist places. Avalon, *Mrs. Trask* G5, G26; *Brandegee* 61; Avalon Cañon and Silver Cañon, *Smith* 4993, 5109; Rock Spring Cañon, *Mills* 4506, 4706; Avalon Run, Big Wash Cañon and Typha Cañon, *Nuttall* 172, 234, 308, 670.

2. *P. monspeliensis* Desf. Fl. Atlant. 1:67 (1798).

Annual; culms erect or decumbent at base, scabrous below the panicle, depauperate or as much as 6 dm. long; sheaths smooth, the ligule large; panicles dense and spike-like, 2.5-15 cm. long, 8-15 mm. wide, tawny-yellow; glumes obtuse, hispidulous, 2 mm. long, terminating in an awn 6-8 mm. long; lemma as in *P. lutosus*.

Introduced from Europe to wet places. Avalon, rare by springs, *Mrs. Trask*, April, 1898; *Brandegee*; Silver Cañon, *Smith* 5108; Rock Spring Cañon, *Nuttall*

248, Rock Falls Cañon 253 & 559; Big Wash Cañon 344,* Pebble Beach Cañon 556; Ridge White's Valley to Echo Lake, *Knopf* 149. BEARD-GRASS.

7. GASTRIDIDIUM Beauv.

Spikelets 1-flowered, in spike-like panicles. Glumes 2, enlarged or saccate at the base, much longer than the floret. Rachilla prolonged behind the palea. Lemma pubescent, truncate, hyaline, awnless or bearing an awn just below the apex. Palea narrow, about as long as the lemma. Cespitose annuals with flat blades and pale shining panicles.

1. **G. ventricosum** (Gouan) Schinz & Thell. Vierteljahrs. Naturf. Ges. Zurich, Jahrg. 58:39 (1913).

Agrostis ventricosa Gouan Hort. Monsp. 39 (1762).

Gastridium lendigerum Gaud. Fl. Helv. 1:176 (1828).

Culms about 3 dm. high, smooth; panicle 5-7.5 cm. long, dense and spike-like; Glumes 3 mm. long gradually narrowed into an awn-point; lemma much shorter than the glumes, globular, pubescent at apex, the awn 5 mm, long, geniculate.

Dry open banks. Arroya beyond Chicken Johnny's, *Mills* sp. 4552; slopes near Avalon, *Davidson* (reported as *Gastridium australe*!); Middle Ranch Cañon, *Nuttall* 297, 735.

8. AGROSTIS Linn.

Spikelets 1-flowered, in narrow open panicles. Glumes subequal, acute or acuminate. Lemma shorter than the glumes, thin, obtuse, awnless or awned from the back. Palea small, minute or wanting. Rachilla (except in sect. Podagrostis) not prolonged. Annual or usually perennial, slender grasses with small spikelets.

Palea evident, 2-nerved:

Glumes scabrous on keel and back.

1. verticillata.

Palea wanting, or a small nerveless scale;

Plants spreading by rhizomes.

2. diegoensis.

Plants tufted, not producing rhizomes.

3. exarata.

1. **A. verticillata** Vill. Prosp. 16 (1779).

Agrostis stolonifera of Jeps. Fl. Calif.

Culms usually decumbent at base, sometimes with long, creeping and rooting stolons; panicle contracted, lobed or verticillate, especially at base 4-10 cm. long, light green or rarely purplish, the branches spikelet bearing from the base; glumes equal, obtuse, scabrous on

*A dwarf form, 3-4.5 cm. high, with very narrow ligules and blades and with panicles but 6 mm. long. Growing in damp moss of the creek-bed.

back and keel, 2 mm. long; lemma 1 mm. long, awnless, truncate and toothed at apex; palea nearly as long as the lemma.

Moist situations. In crevices of wet rock. Rock Spring Cañon, *Millsp.* 4642.

2. **A. diegoensis** Vasey, Bull. Torr. Club 16:55 (1886).

Agrostis foliosa Vasey *idem.* Not Roem. and Shult.

Culms erect 2.5-4.5 dm. high, erect from creeping rhizomes; panicles somewhat contracted almost spike-like 5-10 cm. long the branches stiffly ascending; lemma a little shorter than the glume, awnless, or with straight or rarely a bent awn, the hairs at base minute; palea wanting.

Moister hillside meadows. Rare. Avalon Cañon, *Trask.* *Brandegee* 50 (as *Agrostis canina* L.); Golf Links Cañon, Cañon Opposite Chicken Johnny's, and near the Equestrian Trail, *Nuttall* 94, 325, 337, 338. BENT GRASS.

3. **A. exarata** Trin. Gram. Unifl. 207 (1824).

Culms erect 6-12 dm. high, or often depauperate; panicle contracted and spike-like or loose and somewhat spreading, the branches densely flowered; glumes 3-4 mm. long, scabrous on the keel and usually on the back; Lemma 2 mm long, awnless, or rarely with a short prickle on the back; palea a minute nerveless scale 1 mm. long.

Moist situations. *Brandegee* list. There is no specimen in the U. S. Herb. from Catalina, though it is quite possible that the *Brandegee* reference is correct. BENT GRASS.

9. **AVENA** Linn.

Spikelets 2-6-flowered, in open panicles. Rachilla bearded below the florets. Glumes subequal, membranaceous, many-nerved, longer than the lemmas and usually exceeding the uppermost floret. Lemmas indurated except toward the summit, 5-9-nerved, bidentate at apex, bearing a long, dorsal, twisted awn (often straight or wanting in cultivated forms). Annuals or perennials with large spikelets.

Lemmas pubescent with long, usually brown hairs.

Teeth of lemmas acute, not awned.

Teeth of lemmas awned.

1. *fatua*.

2. *barbata*.

1. **A. fatua** Linn. Sp.Pl. 80 (1753).

Culms 3-9 dm. high, erect, stout; panicle loose and open the slender branches usually horizontally spreading; spikelets usually 3-flowered; glumes about 2.5 cm. long; rachilla and lower part of the shining lemma clothed with long stiff brownish hairs; florets readily falling from the glumes; lemma nerved above, about 19 mm. long, the teeth acuminate but not awned; awn stout, geniculate, red-brown, twisted below, about 3.75 cm. long.

A native of Europe, now one of the common grasses of the Pacific Coast. *Mrs. Trask, Brandegee, Lyon;* Pebble Beach and Avalon Cañon, *Millsp.* 4554, 4738. WILD OATS.

2. **A. barbata** Brot. Fl. Lusit. 1:108 (1804).

Similar to *A. fatua*; spikelets somewhat smaller, 2-flowered, the pedicels curved and capillary; lemma clothed with stiff red hairs, the teeth acuminate and ending in fine awns 4 mm. long.

A native of Europe, now established in fields and waste grounds throughout the Pacific Coast. The most plentiful grass on the mountain slopes of Catalina. *McClatchie*; Avalon, *Chase* 5563; *Knopf* 27; *Millsp.* 4536, 4555, 4663; *Nuttall* 560. WILD OATS.

10. **CAPRIOLA** Pers.

Spikelets 1-flowered, compressed, awnless, sessile in 2 rows along one side of a continuous rachis. Glumes unequal, narrow, acute, keeled. Rachilla prolonged behind the floret as a blunt pedicel. Lemma broad, boat-shaped, obtuse, ciliate on the keel. Palea as long as lemma, the prominent keels close together, ciliolate. Low perennials with creeping rhizomes or stolons and slender digitate unilateral spikes.

1. **C. Dactylon** (L.) Ktze. Rev. Gen. Pl. 2:764 (1891).

Panicum dactylon Linn. Sp. Pl. 58 (1753).

Cynodon dactylon Pers. syn. 1:85 (1805).

Culms flattened, wiry, glabrous; ligule a conspicuous ring of white hairs; spikes 4 or 5, 2.5-6.5 cm. long; spikelets imbricated, 2 mm. long, the lemma longer than the glumes.

A native of the warmer parts of the Old World now sparingly established on Catalina. *Mrs. Trask*; Avalon Cañon, *Smith* 5003; Avalon, *Millsp.* 4540; Coach Road, *Nuttall* 285. BERMUDA GRASS.

11. **ACHYRODES** Boehmer.

Spikelets of two kinds, in fascicles, the terminal one of each fascicle fertile, the others sterile; fertile spikelet with one perfect floret, the rachilla produced beyond the floret, bearing a small awned empty lemma or reduced to an awn; glumes narrow, acuminate or short-awned, 1-nerved; lemma broader, raised on a slender stipe, scarcely nerved, bearing just below the apex a delicate straight awn; sterile spikelets linear, 1-3 in each fascicle, consisting of 2 glumes similar to those of the fertile spikelet and numerous distichously imbricate, obtuse, awnless, empty lemmas. A low, erect annual with flat blades and oblong compact panicles, the crowded fascicles drooping, the fertile being hidden, except the awns, by the numerous sterile ones.

1. **A. aureum** (L.) Ktze. Rev. Gen. Pl. 2:758 (1891).

Cynosurus aureus Linn. Sp. Pl. 72 (1753).

Lamarckia aurea Moench. Meth. Pl. 201 (1794).

Culms, erect, or decumbent at base, 1-3.75 dm. high; leaves smooth; ligule prominent, decurrent as a broad, scarious margin; panicle dense, 2.5-7.5 cm. long, 13-25 mm. wide, shining, golden-yellow or purplish, the branches close, short, erect; pedicles fascicled, somewhat clavate, pubescent, spreading at right angles, the fascicles with a tuft of long whitish hairs at the base; fertile spikelet about 2 mm. long, the sterile 6-8 mm. long; glumes narrow, hyaline, 2 mm. long; lemmas awned from below the apex.

A Mediterranean species first found on this continent by Parry & Lemmon in 1875; now a common grass in Los Angeles and San Diego Counties. Dry hillsides and open situations generally. *Mrs. Trask 62; Brandegee 60; Avalon Cañon, Smith 4999; Chase 5565; Descanso Cañon and the East Hills, Millsp. 4660, 4839; School House to top of mountain, Nuttall 22; Knopf 98.* GOLDEN TOP.

12. **MONANTHOCHLOË** Engelm.

Spikelets 2 or 3-flowered, unisexual, the staminate and pistillate dissimilar, usually sessile in pairs and concealed within the leaf fascicles, the upper floral leaves becoming smaller, at length reduced to sheaths and resembling the glumes. Lemmas membranaceous, rigid, obtuse or denticulate. Palea enclosed within the lemma.

1. **M. littoralis** Engelm. Trans. Acad. St. Louis 1:436 (1859).

A creeping stoloniferous perennial with wiry stems and short, rigid, crowded leaves.

Salt marshes and mucky tidal flats. *Brandegee list; Catalina Harbor, Pendleton 1425.*

13. **DISTICHLIS** Raf.

Spikelets many-flowered, dioecious, strongly compressed, in small panicles. Glumes unequal, firm, keeled, acute. Lemmas coriaceous, rigid, faintly many-nerved. Rigid erect perennials, with stout rhizomes and dense panicles of rather few spikelets.

1. **D. spicata** (L.) Greene, Bull. Calif. Acad. 2:415 (1887).

Uniola spicata Linn. Sp. Pl. 71 (1753).

Distichlis maritima Raf. Jour. de Phys. 89: 104 (1819).

Pale or glaucous; culms 1-6 dm. high; sheaths overlapping; blades often conspicuously distichous, rigidly ascending; panicle narrow, 1.5-5 cm. long; spikelets 8-17 mm. long, the florets closely imbricated.

Salt marshes and saline soils near the coast. *Mrs. Trask*, Sept. (1896); *Brandegee*; Little Harbor just west of Road House and in black muck of creek-bed, *Nuttall* 761, 818; *Pendleton* 1428. SALT GRASS.

14. DISSANTHELIUM Trin.

Spikelets 2-4-flowered, the uppermost reduced to a stipe, arranged in panicles. Glumes narrow, acute, equaling or exceeding the spikelet, the first 1-nerved the second 3-nerved, Lemma broad, awnless, 3-nerved.

1. *D. californicum* (Nutt.) Benth. Hook. Icon. Pl. 3, 4:56, pl. 1375 (1881).

Stenochloa californica Nutt. Jour. Acad. Phila. 2, 1:189 (1848).

Culms 6 dm. to 1 m. high, smooth; leaves smooth; ligule membranaceous, 2-6 mm. long; blades flat, lax; panicle narrow, loose, 1.5-2 dm. long, the lower branches of clusters rather remote; glumes somewhat unequal, the first about 2-3 mm. long; lemmas about 3 mm. long, minutely villous especially below. Apparently an annual.

Known only from California, especially the Channel Islands. Type from Catalina Island, *Gambel*; *Brandegee*.

15. POA Linn.

Spikelets 2-several-flowered, the uppermost floret rudimentary, in open or narrow panicles. Glumes keeled, 1-3-nerved. Lemmas herbaceous or membranaceous, mostly scarious-tipped, acute or obtuse, keeled, awnless, 5-nerved the intermediate nerves sometimes obscure, keel and marginal nerves sometimes villous, the florets sometimes with cobwebby hairs at base. Annuals or perennials with blades ending in a navicular point.

Plants annual, lemmas villous on nerves below:

Panicle pyramidal, open.

1. annua.

Plants perennial, lemmas pubescent below:

Panicle usually narrow; sheaths scabrous.

2. scabrella.

1. *P. annua* Linn. Sp. Pl. 68 (1753).

Annual; culms flattened, decumbent at base, sometimes rooting at the lower nodes; sheaths loose; blades soft and lax; panicle pyramidal, open, 2.5-7.5 cm. long; spikelets crowded, 3-6-flowered, about 4 mm. long; lemma not webbed at base, distinctly 5-nerved, the nerves pilose on the lower half.

Open situations and waste grounds. *Mrs. Trask* G4; *Brandegee* 48, and May 16 (1890). MEADOW GRASS.

2. *P. scabrella* Benth. Vasey Grasses U. S. 42 (1883).

Tufted perennial; culms erect 6 dm. to 1 m. high, usually scabrous,

at least below the panicle; sheaths scabrous; ligule rather long; blades mostly basal, flat, narrow, usually about 1 mm. wide, lax, more or less scabrous; panicle narrow, usually contracted, sometimes rather open at base, 5-12.5 cm. long; glumes scabrous, 3 mm. long; spikelets narrow, 6-10 mm. long; lemmas 4 mm. long, puberulent or scabrous on back and more or less crisp-pubescent at base.

All situations, especially dry opens. Avalon, *Mrs. Trask*, Mar. (1901); along the Equestrian Trail at 700 ft. alt. and Golf Links Cañon, *Nuttall* 324, 551.

16. *MELICA* Linn.

Spikelets 2-several-flowered, in panicles. Glumes large, unequal, membranaceous or papery, scarious-margined, 3-5-nerved, awnless, a little shorter than the florets. Rachilla prolonged beyond the uppermost fertile floret and bearing 2 or 3 gradually smaller empty lemmas more or less convolute and enclosing one another at the apex. Lemmas firm with scarious margins, 7-nerved awnless or awned below the bifid apex. Perennials, often bulbous at base, with closed sheaths and usually few-flowered panicles.

Fertile florets 1 or 2 in each spikelet:

Fertile lemmas pubescent.

Fertile lemmas glabrous.

1. *Torreyana*.

2. *imperfecta*.

1. *M. Torreyana* Scribn., Proc. Acad. Phila. 1885:43 (1885).

Culms from a loose and decumbent base, 3-9 dm. high, not bulbous; blades flat, lax; panicle narrow, rather loose the branches more or less fascicled, appressed or ascending, the lower fascicles distant; spikelets 6-8.5 mm. long, with 1 or 2 perfect florets and a rudiment; glumes strongly nerved, nearly as long as spikelet; lemmas pubescent; rudiment long-pediceled, obovoid, divergent.

Open banks and slopes. May to August. Pebble Beach Road, *Pendleton & Reed* (*Pendleton*) 1371.

2. *M. imperfecta* Trin. Mem. Acad. St. Petersburg. VI Sci. Nat. 2¹:50 (1836).

Melica poaeoides Nutt. Jour. Acad. Phila. 2, 1:188 (1848).*

Culms erect, 6 dm. to 1 m. high; blades narrow, usually not over 2 mm. wide; panicle narrow, from a few centimeters to 3 dm. in length, the branches more or less fascicled, long and short together; spikelets 4-6 mm. long, purple-tinged, usually with 1 perfect floret and a rudiment; glumes indistinctly nerved; lemma a little longer than the glumes, smooth, indistinctly nerved, obtuse; rudiment oblong, short-pediceled, appressed to the palea.

*The type of Nuttall is said to be from "Santa Catalina Island"—*Gambel*. But I have examined the type specimen in the Herbarium of the British Museum. The label gives the locality as "St. Diego"—*Hitchcock*, Jeps. Fl. Cal. III:148.

Dry open situations. *Lyons*; *Brandege* 56, 58 (1890); *Mrs. Trask* 11, 32 (1897), 7, 21 (1898), and Mar. (1891); Pebble Beach Road, *Smith* 5059; *Mrs. Chase* 5567; Pebble Beach Cañon, Pebble Beach Salina and Wishbone, *Mills* sp. 4758, 4747, 4684; *Pendleton* 1413; Golf Links Cañon and at Chicken Johnny's, *Nuttall* 97, 350; Echo Lake, *Knopf* 32; MELIC GRASS

Melica imperfecta minor Scribn. Proc. Acad. Phila. 1885: 42 (1885).

Blades glabrous, very narrow; plant low, less than 3 dm. high. A scarcely distinct variety.

Mrs. Trask in herb. U. S.

17. FESTUCA Linn.

Spikelets 2-several-flowered in narrow or open panicles. Glumes narrow, acute, the first 1-nerved the second 3-nerved. Lemmas firm, rounded on the back, at least below, acute or awned from tip, rarely obtuse or awned from a cleft apex, faintly 3-5-nerved. Annuals or perennials, usually tufted:

Florets 5-13 in each spikelet.	1. octoflora.
Florets 1-3 in each spikelet:	
Branches of the panicle normally divergent;	
Lemmas glabrous.	2. reflexa.
Branches of the panicle erect or appressed;	
Lemmas ciliate.	3. megalura.
Lemmas not ciliate.	4. myuros.

1. **F. octoflora** Walt. Fl. Carol. 81 (1788).

Festuca tenella Willd. Sp. Pl. 1:419 (1797).

Culms slender, erect, usually 1.5-3 dm. high; blades narrow, involute; panicle narrow, the branches short, appressed; spikelets 6-8 mm. long, densely 5-13-flowered; glumes subulate-lanceolate, the first 1-nerved, 3 mm. long, the upper 3-nerved, 6 mm. long; lemmas firm, convex, lanceolate, glabrous or scabrous, the margins not scarious, 4-6 mm. long, attenuate into a scabrous awn 2-4 mm. long.

Open situations. *Brandege* 49; Avalon, *Grant* 4790; a very few individuals in sand of the dry creek-bed of Silver Cañon, *Nuttall* 501. FESCUE GRASS.

2. **F. reflexa** Buckl. Proc. Acad. Phila. 1862:98 (1863).

Culms 3.5-7.5 dm. high; sheaths smooth or pubescent; blades narrowly linear, flat or loosely involute; panicle 5-12.5 cm. long, the solitary rays and the spikelets all at length divaricate; spikelets 1-3-flowered, 5-7 mm. long; glumes glabrous, the first 2-4 mm. long, the second 4-6 mm. long; lemmas glabrous or somewhat scabrous, 5-6 mm. long, attenuate into a scabrous awn usually 5-8 mm. long.

Open rocky slopes. Avalon, in cañons, very rare, *Mrs. Trask* G22; Rock Falls Cañon, May 6, 1919, *Moxley* 697.

3. *F. megalura* Nutt. Jour. Acad. Phila. 2, 1:188 (1848)

Culms 2-12 dm. high; sheaths and blades smooth; panicle narrow, 0.75-2 dm. long, the branches appressed; spikelets 4-5-flowered; glumes glabrous, very unequal, the first about 2 mm. long or less, the second 4-6 mm. long; lemmas linear-lanceolate, scabrous above, ciliate on the upper half, attenuate into an awn about twice its length. The cilia on the lemmas, by which this species is distinguished from the next, are sometimes hidden by the incurved edges of the lemma at maturity.

Rich, grassy hillsides. Avalon, *Mrs. Track 619*; Golf Links Cañon, mountain beyond Pebble Beach and Rock Falls Cañon, *Nuttall 98, 557, 559*; in crevices of rock in Rock Falls Cañon, Pebble Beach Cañon and slopes of Mt. Martha, *Millsp. 464, 4756, 4849*; Silver Canyon, *Nuttall 710, 734, 1218*; *Knopf 99, 204*.

4. *F. myuros* Linn. Sp. Pl. 74 (1753).

Similar to the last, but lemmas not ciliate.

Introduced in the United States from Europe. Rare on the Pacific Coast. *Brandegee 53*; on loose, shaly soil of a dry, open hillside in Descanso Cañon, and on the dry roadside at the Wishbone, *Millsp. 4667, 4679*.

18. *BROMUS* Linn.

Spikelets few-many-flowered, terete or flattened, in narrow, open panicles. Glumes unequal, acute, 1-5-nerved. Lemmas convex or sharply keeled, 5-9-nerved, usually 2-toothed at apex and awned from between the teeth, sometimes awnless, the awn straight or divergent, sometimes twisted. Annuals or perennials with usually flat blades and rather large spikelets.

Annuals.

Panicle contracted, dense;

Awn 3-8 mm. long.

Awn 17-30 mm. long.

Panicle open, branches spreading;

Awn twisted and bent.

Awn not twisted and bent.

Awn 2.1 cm. long.

Awn 3.8-5 cm. long.

1. *hordeaceus*.

2. *rubens*.

3. *Trinii*.

4. *tectorum*.

5. *rigidus*.

Perennials.

Spikelets subterete, not strongly flattened.

Spikelets strongly flattened;

Blades canescent, densely pilose.

Blades glabrous or somewhat pilose.

6. *Orcuttianus*.

7. *subvelutinus*.

8. *carinatus*.

1. *B. hordeaceus* Linn. Sp. Pl. 77 (1753).

Culms, 17.8 cm. to 8.7 dm. high; sheaths retrorsely softly pilose-pubescent; blades usually pubescent; panicle contracted, erect, 5.1-10.2 cm. or, in depauperate plants, reduced to a few spikelets; glumes broad, coarsely pilose or scabrous-pubescent, the first 3-5-nerved, 4-6 mm. long, the second 5-7-nerved, 6-8 mm. long; lemmas broad, obtuse, 7-

nerved, coarsely pilose or scabrous-pubescent, rather deeply bidentate. 8-10 mm. long, the margin and apex hyaline; awn rather stout, 6-9 mm. long; palea about three-quarters as long as lemma.

A weed in waste places and cultivated soils. Avalon, *Chase* 5564. Avalon Valley beyond Chicken Johnny's, Cherry Valley and Hamilton Beach, *Mills* sp. 4550, 4803, 4901; Golf Links Cañon and Silver Cañon, *Nuttall* 561, 671; *Knopf* 100. BARLEY CHEAT.

2. *B. rubens* Linn. Cent. Pl. 1:5 (1755).

Culms 15.2 cm. to 4.7 dm. high, puberulent below the panicle; sheaths and blades pubescent; panicle erect, compact, ovoid, usually purplish, 3.8-7.6 cm. long; spikelets 7-11 flowered, about 2.5 cm. long; glumes narrow, acuminate, pubescent or sometimes smooth, the first 1-nerved, 8-10 mm. long, the upper 3-nerved, 11-13 mm. long; lemmas lanceolate, acute, 5-nerved, pubescent or smooth, 13-17 mm. long, the apex deeply cleft into 2 long-acuminate hyaline teeth, 4-6 mm. long; awn straight, 1.9-2.3 cm. long.

Dry hilltops, roadsides, waste grounds, in sand and among pebbles everywhere common. *Brandegee* 51; *Smith* 4996; Avalon, *Chase* 5562; Isthmus, *Grant* 6147; *Knopf* 29, 97, 202, 205; *Mills* sp. 4551, 4668, 4740, 4761, 4803, 4900, 4911; *Nuttall* 96. Dr. Davidson says (So. Calif. Acad. Sci. 6:11) "It was rare and local in Los Angeles County in 1892, but now (1907) may be found in many parts of the county, even as far as the Mojave Desert." RED BROME GRASS.

3. *B. Trinii* Desv. Gay Fl. Chil. 6:441 (1853).

Culms erect 3.4-7 dm. high; sheaths pilose or nearly smooth; blades usually pilose; panicle narrow, 10.2-20.4 cm. long, rather dense; spikelets narrow, 5-7-flowered, 1.5-2.5 cm. long; glumes lanceolate, acuminate, smooth, the first 8-10 mm. long, 1-nerved, the second broader, 13-17 mm. long, mostly 3-nerved; lemmas coarsely and sparsely pubescent, 13-15 mm. 5-nerved, with 2 narrow teeth 2 mm. long; awn 17-21 mm. long, twisted below, bent below the middle and strongly divaricate when old.

Dry slopes. *Brandegee*, May 12, 1890, 55.

4. *B. tectorum* Linn. Sp. Pl. 77 (1753).

Culms 3.4-7 dm. high, smooth, slender; sheaths and blades pubescent; panicle broad, rather dense, drooping, 5.1-15.2 cm. long, the branches slender; spikelets pubescent, nodding, linear becoming cuneiform in flower, 13-21 mm. long; glumes narrow, acute, glabrous, the first 1-nerved, 4-6 mm. long, the second 3-nerved, 8-10 mm. long; lemmas lanceolate, acute, glabrous, 5-nerved, 10-12 mm. long, bidentate at apex; awn straight, 13-15 mm. long.

Hillsides. Pebble Beach and Golf Links Cañon, *Nuttall* 95, 558, 562, 1219.

5. **B. rigidus** Roth. Roem. & Ust. Mag. Bot. 10: 21 (1790).
Bromus villosus Forsk. Fl. Aeg. Arab. 23 (1775) not Scop.
 (1772).

Culms 5.1-8.7 dm. high; sheaths and blades pilose; panicle open, rather few-flowered, 7.6-12.7 cm. long, the lower branches 1.2-2.5 cm. long; spikelets usually 5-7-flowered, 5.1-7 dm. long; glumes smooth, narrow, acuminate, the first 1.7-2.1 cm. long, 1-nerved, the second 2.5-3.8 cm., 3-nerved; lemmas 5-nerved, 2.5-3.8 cm. long, scabrous or puberulent, 2-toothed, the teeth 3-4 mm. long; awn stout, 3.8-5.1 cm. long.

A Mediterranean grass becoming a weed in open situations. Big Wash Cañon, *Mills* sp. 4855.

Bromus rigidus Gussoni (Parl.) Coss. & Dur. Expl. Sci. Alger. 2: 159 (1867).

Bromus villosus Gussoni Asch. & Graeb. Syn. Mitt. Fl. 2: 595 (1901).

Differs from the above species in having a more open panicle, the lower branches as much as 10.1-12.6 cm. long.

A south Europe form of grass more common in California than the species itself. Avalon. *Mrs. Trask* 624; *Chase* 5561. Among the dry pebbles of Hamilton Beach, *Mills* sp. 4899; in the arroyo of Golf Links Cañon, *Nuttall* 99.

6. **B. Orcuttianus** Vasey, Bot. Gaz. 10: 223 (1885).

Culms erect, leafy below, nearly naked above, 8.7 dm. to 1.2 m. high, pubescent at and below the nodes; sheaths pilose or more or less velvety; blades glabrous, rather short and erect; panicle narrow, pyramidal, erect, 10.1-15.2 cm. long, the branches few, divaricate and rather rigid in fruit; spikelets 2.1-2.5 cm. long, subterete, on short, stout pedicels; glumes narrow, smooth or scabrous, the first acute, 6.5-9 mm. long, 1-nerved or sometimes with a faint lateral pair, the second broader, obtuse, 8.5-10.5 mm. long, 3-nerved; lemmas 10-12 mm. long, narrow, scabrous or scabrous-pubescent over the back, the awn 5-7 mm. long.

Open-wooded slopes. *Brandegee* 62 in herb. U. S. Natl. Mus.

7. **B. subvelutinus** Shear, U. S. Div. Agrost. Bull. 23: 52 (1900).

Perennial; culms 3.4-7 dm. high; sheaths canescent; blades narrow, rather rigid, becoming involute, canescent and also pilose; panicle 5.1-10.4 cm. long, narrow, erect, the branches short, erect; spikelets about 2.5 cm. long; glumes puberulent, the first 8.5-1.5 mm. long, 3-5-nerved the second 10.1-12.1 mm. long, 7-nerved; lemmas appressed-puberulent, 13-15 mm. long; awn 3-4 mm. long.

Dry, hard adobe soil of open hillsides and meadows. Infrequent, at least this season (1920), *Mills* sp. 4632.

8. **B. carinatus** Hook. & Arn. Bot. Beech. 403 (1841).

The form with smooth sheaths (*Bromus carinatus Hookerianus* Shear.). Annual; culms 0.7-1 m. high, sheaths pilose; blades narrow, flat, more or less pilose; panicle pyramidal, rather lax, the lower branches spreading or drooping; spikelets about 5 mm. wide, 5-9-flowered; glumes lanceolate, acute, glabrous or slightly scabrous-pubescent, the first 7-9 mm. long, 3-nerved, the second 9-11 mm. long, 5-nerved; lemmas lanceolate, puberulent or short-pubescent, 14-17 mm. long; awn 7-10 mm. long.

Open situations in general. Infrequent at Avalon, *Mrs. Trask* 57; *Brandegee*, May 12, 1890, both specimens in herb. U. S. Natl. Mus.

B. vulgaris Shear, U. S. Div. Agrost. Bull. 23: 43 (1900).

B. ciliatus of Thurber in Wats. Bot. Calif. 2: 320, not Linn.

Brandegee lists this species from Catalina but no specimen has been seen by us. It is possible that his specimen was determined from the description in Bot. Calif. and that the specimen was lost in the Calif. Acad. fire. CHEAT.

19. **LOLIUM** Linn.

Spikelets several-flowered, solitary at each node of a continuous rachis, one edge of each spikelet placed against the rachis, the glume on that edge (the first glume) wanting, but both glumes present on the terminal spikelet. Glume marrow, rigid, 5-7-nerved, longer than the lower lemma, often exceeding the uppermost. Lemmas convex, 5-7-nerved, awned or awnless. Annuals or short-lived perennials with flat blades and spikelets scattered in terminal spikes.

1. **L. temulentum** Linn. Sp. Pl. 83 (1753).

Annual; culms 7 dm. to 1 m. high; spike stout and strict, 15.2-20.3 cm. long; glume about 2.5 cm. long, as long or longer than the 5-7-flowered spikelet, firm, pointed; lemmas as much as 8 mm. long obtuse, awned; awn as much as 8 mm. long.

A European grass established in fields and waste grounds. *Brandegee* 52; Avalon, *Mrs. Chase* 5560. Dry roadside near the spring at the Wishbone, *Mills* 4680; *Nuttall* 211, 724. DARNEL.

20. **PHOLIURUS** Trin.

Spikelets 1-2 flowered, solitary at the nodes, imbedded in the articulated rachis. Glumes 2, placed in front of the spikelet and enclosing it, coriaceous, 5-nerved, acute, unsymmetrical, appearing like halves of a single split glume. Lemmas much smaller than the glumes, hyaline, keeled. Low annuals with slender spikes.

1. *P. incurvatus* (L.) Hitchc. U. S. Dept. Agric. Bull. 772:106 (1920).

Aegilops incurvata Linn. Sp. Pl. ed. 2, 2:1490 (1763).

Lepturus incurvatus Trin. Fund. Agrost. 123 (1820).

Culms tufted, decumbent at base, 1-2 dm. high; blades short and narrow; spike 7.6-10.2 cm. long, cylindrical, curved; spikelets 7 mm. long, pointed.

Mudflats and salt marshes. In springs on the eroded cliffs at the West End, *Mrs. Trask*; *Brandegge* 54, both these in herb. U. S.; dried mud of the salina at Catalina Harbor and in the salina at Pebble Beach, *Parish*; *Nuttall*, 563, 564. HARD GRASS.

21. HORDEUM Linn.

Spikelets 1-flowered, 3 together at each joint of the rachis, the middle one sessile and perfect, the lateral usually pedicled, often reduced to awns. Glumes equal, rigid, narrow-lanceolate, subulate or setaceous; usually elongated and awn-like, the three pairs simulating an involucre around the central perfect floret. Rachilla prolonged behind the palea as an awn, sometimes with a rudimentary floret. Lemma of central floret obscurely 5-nerved, tapering into an awn. Palea with its back toward the rachis. Cespitose annuals or perennials with dense terminal bristly spikes disarticulating at maturity, the joints falling with the spikelets attached.

Plants annual.

Glumes not ciliate:

Glumes of fertile spikelet dilated above the base. 1. pusillum.

Glumes not dilated. 2. nodosum.

Glumes, or some of them, ciliate. 3. murinum.

1. *H. pusillum* Nutt. Gen. Pl. 1:87 (1818).

Annual; culms 1-4.8 dm. high; blades erect, flat; spike erect, 2.5-7.6 cm. long, 1-1.5 cm. wide; lateral pair of spikelets abortive, the first glume of each and both glumes of the fertile spikelet dilated above the base, attenuate into a slender awn 8-13 mm. long; glumes very scabrous; lemma unawned.

Open places under saline influence. *Mrs. Trask* G6; Avalon, *McClatchie*; along the upper road to Pebble Beach, *Nuttall* 565. BARLEY GRASS.

2. *H. nodosum* Linn. Sp. Pl. ed. 2, 1:126 (1762).

Similar to the last, but usually taller and with all the glumes awn-like.

Fields, waste places and open grounds. Avalon, *Mrs. Trask* G34. In the Pebble Beach Salina, at the Isthmus, and in Cherry Valley, *Mills* 4628, 4748, 4824; at Pebble Beach, *Nuttall* 190.

3. *H. murinum* Linn. Sp. Pl. 85 (1753).

Annual; culms bushy-branched, spreading; sheaths and blades smooth; spikes 5.1-7.6 cm. long, often partially enclosed by the uppermost inflated sheath; glumes of the central spikelet narrowly spindle-form, 3-nerved, long-ciliate on both margins, the nerves scabrous; awn about 2.5 cm. long; glumes of the lateral spikelets unlike, the inner similar to the central, the outer setaceous, not ciliate; lemmas all broad, 8-10 mm. long, the awns somewhat exceeding those of the glumes.

Fields, waste places and open situations. *Lyon*; Avalon, *Mrs. Trask*, May (1898); *Mrs. Chase* 5526; *Brandege*; *Mills* 4601, 4629, 4660; *Nuttall* 114, 315; *Knopf* 28. A pernicious grass known locally as FOXTAIL and SQUIRREL GRASS.

[*H. vulgare* Linn. Sp. Pl. 84 (1753).

A frequently established escape from cultivation to roadsides and open situations quite generally. *Mrs. Trask*, June (1898). Near Avalon and at the Isthmus, *Mills* 4739; Middle Ranch Cañon, *Nuttall*, 305. BARLEY.]

22. *ELYMUS* Linn.

Spikelets 2-6-flowered, in pairs, sessile at the joints of a continuous rachis, rarely single or more than two together. Glumes equal, usually narrow and rigid, 1-3-nerved, acute or awned, placed at the sides or close together in front of the florets. Lemmas convex, obscurely 5-nerved, usually acute or awned from the apex. Erect perennials with terminal, often bristly spikes.

Glumes subulate, nearly or quite nerveless:

Plant stout and tall, blade flat, spike dense.

Plant slender, blade involute, spike slender.

Glumes, lanceolate, distinctly nerved.

1. *condensatus*.

2. *triticoides*.

3. *glaucus*.

1. *E. condensatus* Presl. Rel. Haenk. 1:265 (1830).

Culms in large tufts, stout, 1-2 m. high, producing stout, knotty rhizomes; sheaths smooth; blades flat, as much as 2 cm. wide; spike erect usually dense, as much as 3.4 dm. long, sometimes branched; glumes narrowly lanceolate or subulate, awn-pointed, usually only 1-nerved, or nerved, or nerveless; about as long as the first lemma; lemmas awnless or mucronate.

Hillsides, gullies and ditches. *Lyon*, who says: "Much taller than on mainland . . . when growing in dry sterile places it overtops a tall man on horseback"; *Brandege*; Gallagher's Cañon, *Eastwood* 6477; in dry hollows at Hay Press Chute, 8 ft. high, *Mills* 4580; Banning's Beach and Hamilton Cañon, *Nuttall* 330, 552; *Pendleton* 1399; Middle Ranch Cañon, *Nuttall* 1206; *Knopf* 125; Pebble Beach back road, *Knopf* 158, 178. WILD RYE.

2. *E. triticoides* Buckl. Proc. Acad. Phila. 1862:99 (1863).

Culms usually glaucous, 7-14 dm. tall, usually in large masses from extensively creeping, scaly rhizomes; sheaths smooth or scabrous; blades narrow, mostly 2-6 mm. wide, flat or soon involute; spike erect, slender, sometimes branched; glumes subulate, 10-12 mm. long; lemmas 6-8 mm. long, glabrous, short-pointed.

Moist bottoms and alkaline soil. Avalon, *Mrs. Trask* G25; *McClatchie*. *Dr. Davidson*.

3. *E. glaucus* Buckl., Proc. Acad. Phila. 1862:99 (1863).

Culms erect, 3.4-7 dm. high, rarely taller; sheaths smooth, or scabrous; blades flat, as much as 1 cm. wide, scabrous on both surfaces, sometimes narrow and more or less involute; spike erect, usually dense, long-exserted, 5-15 cm. long, rarely longer; glumes about as long as the spikelet, lanceolate, 8-12 mm. long, acuminate or awn-pointed, with 2-4 scabrous nerves; lemmas awned, the awn about 1 or 2 times as long as the body.

Hillsides and slopes. May to August. Silver Canyon, *Nuttall* 1203.

23. **SITANION** Raf.

Spikelets 2-several-flowered; in two's or three's rarely solitary, at each joint of the articulate rachis. Glumes entire, bifid or several-parted, narrow or setaceous, long-awned. Lemmas long-awned. Tufted perennials with bristly, readily disarticulating spikes.

1. *S. jubatum* J. G. Smith, U. S. Div. Agrost. Bull. 18:10 (1899).

Culms erect, 3.4-7 diam. high, rarely taller; sheaths smooth, scabrous or villous-pubescent; blades flat, often becoming involute, smooth or usually more or less pubescent at least on upper surface, usually not over 3 mm. wide; spike erect, dense, 2.5-7.6 cm. long, thick and bushy from the numerous long awns; glumes split into 3 or more lobes or divisions each extending into a long awn; lemmas mostly 8-10 mm. long, smooth, or scabrous toward the apex, the awns and those of the glumes 3.8-10.2 cm. long.

Rocky hillsides. Head of Grand Cañon, *Nuttall* 314.

[*Agropyron repens* Beauv. Ess. Agrost. 102: 146 (1812).

This grass has been listed by *Brandege* but no specimen of his has been seen. There is no other report or specimen from the Island].
WHEAT GRASS.

Family 2. **CYPERACEÆ.**

SEDGE FAMILY.

Grass-like or rush-like herbs. Stems (culms) slender, solid (rarely hollow), triangular, quadrangular, terete or flattened. Roots

fibrous (many species perennial by long rootstocks). Leaves narrow, with closed sheaths. Flowers perfect or imperfect, arranged in spikelets, one (rarely 2) in the axil of each scale (glume, bract), the spikelets solitary or clustered, 1-many-flowered. Scales 2-ranked or spirally imbricated, persistent or deciduous. Perianth hypogynous, composed of bristles, or interior scales, rarely calyx-like, or entirely wanting. Stamens 1-3, rarely more. Filaments slender or filiform. Anthers 2-celled. Ovary 1-celled. Ovule 1, anatropous, erect. Style 2-3-cleft or rarely simple or minutely 2-toothed. Fruit a lenticular, plano-convex, or trigonous achene. Endosperm mealy. Embryo minute.

Flowers perfect:

Style-base persistent as a tubercle.

Style-base deciduous, no tubercle.

Flowers monoecious or dioecious.

1. ELEOCHARIS.

2. SCIRPUS.

3. CAREX.

1. ELEOCHARIS R. Br.

Annual or perennial scapose herbs. Leaves reduced to sheaths, or the lowest very rarely blade-bearing. Scapes simple, triangular, quadrangular, terete, flattened or grooved. Spikelets solitary, terminal, erect, several-many-flowered, not subtended by an involucre or rarely by 2 small bracts. Scales concave, spirally imbricated. Perianth of 1-12 bristles, usually retrorsely barbed, wanting in some species. Stamens 2-3. Stigmas 2 and achene lenticular or biconvex, or when 3, the achene 3-angled, but sometimes with very obtuse angles and appearing turgid. Base of the style persistent on the summit of the achene, forming a tubercle.

1. *E. palustris* (L.) R. & S. Syst. Veg. 2:151 (1817).

Perennial by horizontal rootstocks; stems stout, terete or nearly so, striate, 3-8 dm. high; basal sheaths brown, rarely bearing a short blade, the upper one obliquely truncate; spikelet ovoid-cylindric, 6-24 mm. long, 3-4 mm. broad, thicker than the stem; scales ovate-oblong or ovate-lanceolate, purplish-brown with scarious margins and a green midvein; bristles usually 4, slender, retrorsely barbed, longer than the achene, sometimes wanting; stamens 2-3; style 2-3-cleft; achene brownish or yellowish-brown, smooth, obovate; tubercle conic-triangular, constricted at the base, flattened, $\frac{1}{4}$ - $\frac{1}{2}$ as long as the achene.

Wet places along streams. May to August. *Brandege*; Upper end of Grand Canyon, *Nuttall* 313; dried up bed of Echo Lake, *Knopf* 212. SPIKE RUSH.

2. **SCIRPUS L.**

Annual or perennial very small or very large sedges, with leafy culms or the leaves reduced to basal sheaths. Spikelets terete or somewhat flattened, solitary, capitate, spicate or umbellate, subtended by a 1-several-leaved involucre or the involucre wanting in some species. Scales spirally imbricated all around, usually all fertile, the 1-3 lower sometimes empty. Flowers perfect. Perianth of 1-6, slender or rigid, short or elongated, barbed, pubescent or smooth bristles, or none in some species. Stamens 2-3. Style 2-3-cleft, not swollen at the base, wholly deciduous from the achene, or its base persistent as a subulate tip.

1. **S. pacificus Britton**, So. Calif. Acad. Sci. 4:8 (1905)

Perennial by large rootstocks; stems stout, sharply 3-angled with flat sides, scabrous above, 6-15 dm. high; leaves equaling or exceeding the stem, rough-margined, 5-10 mm. wide, midvein prominent; involucre leaves 2-4, elongated, erect, similar to those of the stem, often 3 cm. long; spikelets in a dense, often compound terminal cluster of 6-20, ovoid-oblong, obtuse or subacute, 16-24 mm. long, 8-10 mm. broad; scales ovate, brown, puberulent, lacerate or 2-toothed midvein excurrent into an at length reflexed awn; bristles 1-6, shorter than the achenes, or none; style 2-cleft; achene compressed, flat on the face, convex or with a low ridge on the back, obovate-orbicular, dark brown, shining, 3 mm. long.

Marshes, especially in somewhat saline places. June-October. In black muck of the creek-bed, northwest beach at Little Harbor, *Nuttall 816*; *Knopf 190*. BULRUSH.

3. **CAREX L.**

Grass-like sedges, perennial by rootstocks, with mostly 3-angled stems. Leaves 3-ranked, the upper elongated or short and subtending the spikes of flowers or wanting. Flowers monoecious or dioecious, solitary in the axils of scales. Spikes either wholly pistillate or staminate, or bearing staminate and pistillate flowers (androgynous). Perianth none. Staminate flowers of 3 stamens. Pistillate of a single pistil with a style and 2-3 stigmas borne on a very short axis in the axil of a scale-like bractlet (perigynium) which completely encloses the achene. Achene 3-angled, lenticular or plano-convex.

1. **C. triquetra Boott**, Trans. Linn. Soc. 20:126 (1846).

Culms smooth, erect, 3-6 dm. tall; leaves glaucescent, minutely scabrid, prominently many-nerved, 1-3 mm. wide, shorter than the

culms; lowest bract grass-like, sheathing at base, the upper aristate from a scarious base; staminate spike erect, 1.5-2 cm. long, sometimes having a small basal spike; pistillate spikes 2-5, the uppermost subsessile, approximate, the lowest remote on a long or shorter peduncle, 1-3 cm. long; scales shorter and narrower than the perigynia, castaneous with green midvein and hyaline margins, ovate, concave, acute or mucronate, serrate on the back; perigynia greenish, ovoid, nerved in the intervals, 3-5 mm. long, terminating in a short, bidentate beak; achenes closely conformed to the perigynia.

Growing near canyon streamlets. May to October. *Brandegei*; Rock Spring Canyon, *Nuttall 131*. **SEDGE.**

Order 4. LILIALES.

Scapose or leafy-stemmed herbs from bulbs or corms, or rarely with rootstocks or a woody caudex (*Yucca*), the leaves various. Flowers solitary or clustered, regular, mostly perfect. Perianth parted into 6 distinct or nearly distinct segments, or these more or less united into a tube inferior or partly superior (*Alettris*). Stamens 6, hypogynous or borne on the perianth or at the bases of its segments; anthers 2-celled, mostly introrse, sometimes extrorse. Ovary 3-celled; ovules few or numerous in each cavity, anatropous or amphitropous; styles united; stigma 3-lobed or capitate. Fruit a usually loculicidal capsule, or in *Yucca* sometimes fleshy and indehiscent. Seeds various, winged or wingless. Embryo in copious endosperm.

Sepals and petals chaffy.

Fam. 1. JUNCACEAE.

Sepals and petals not chaffy.

Fam. 2. ALLIACEAE.

Flowers in umbels.

Fam. 3. LILIACEAE.

Flowers solitary or racemose.

Family 1. JUNCACEÆ.

RUSH FAMILY.

Flowers perfect, with a regular persistent perianth of 6 similar glumaceous segments in 2 rows, 6 nearly hypogynous included stamens (rarely 3) with persistent filiform filaments and 2-celled anthers, and a superior 3-celled ovary (sometimes 1-celled with 3 parietal placentae) with 3 or many ascending anatropous ovules, a single very short style, and 3 filiform stigmas (flowers very rarely dimerous throughout); capsule loculicidally 3-valved; seeds with membranous or cellular testa, often caudate or appendaged; embryo minute, thick, enclosed within the base of the fleshy albumen. Rushes or sedge-like herbs, mostly caespitose perennials or with creeping rhizomes, with terete hollow or spongy usually simple stems, and

alternate sheathing leaves, either flat, channelled, or terete; flowers small, usually sessile, scarious-bracteolate, in cymes or panicles, subumbellate clusters or spicate heads.

1. JUNCUS, Linn.

Stamens 6, or sometimes 3 by suppression of the inner ones. Capsule globose to pyramidal, many-seeded, 3-valved, 3-celled with central placentae or 1-celled with parietal placentae.—Perennial or sometimes annual.

Panicle lateral.

Flowers clustered.

Flowers solitary.

Panicle terminal.

1. robustus.

2. balticus.

3. bufonius.

1. *J. robustus* Wats. Proc. Am. Acad. 14: 302 (1879).

J. acutus sphaerocarpus Engelm, Wheeler's Rep. 6: 376 (1878).

Stems and leaves 0.5-1.5 m. high, stout, rigid and pungent, growing in large tussocks; panicle 6-12 cm. long, about equaling the spathe, secondary spathes long-acuminate; clusters 2-4-flowered; perianth segments scariously margined, outer broadly lanceolate, acute, inner obovate, deeply emarginate, 2 mm. long; capsule subglobose; apiculate, about 4 mm. long.

Dense clumps in wet places. June to September. *Brandege*; bed of Cottonwood Canyon, *Nuttall* 763; Little Harbor, *Knopf* 230; **STOUT RUSH.**

2. *J. balticus* Willd. Ges. Naturf. Fr. Berl. Mag. 3: 298 (1890).

Stems rigid, rather slender, leafless, 3-4 dm. high; panicle 2-4 cm. long; perianth segments lanceolate, acute, 4-5 mm. long, brownish; capsule rather acutely angled, beaked; seeds distinctly reticulate.

Wet places at all altitudes. May to August. *Brandege*; Middle Ranch Canyon, *Smith* 5115, *Nuttall* 296; "Sink" between bases of Black Jack and Orizaba, *Knopf* 101; Little Harbor back of N. W. beach. *Nuttall* 814; Avalon Valley, *Nuttall* 250, 718. **WIRE RUSH.**

3. *J. bufonius* L. Sp. Pl. 328 (1753).

Stems usually branching from the base, 5-24 cm. high, with fibrous roots; leaves 0.5 mm. wide or less; flowers mostly solitary and remote upon the spreading branches; perianth segments lanceolate, greenish, with scarious margins, 4-6 mm. long; stamens 6, sometimes 3, 2-3 mm. long; anthers shorter than the filaments; capsule oblong, obtuse, shorter than the perianth.

Moist places. May to August. *Lyon*; *Brandege*; upper left fork of Middle Ranch Canyon, *Nuttall* 312. **BULLFROG RUSH. TOAD RUSH.**

Family 2. **ALLIACEÆ.**

ONION FAMILY.

Perennial mainly scapose herbs, with bulbs or corms. Leaves basal or more rarely cauline; blades narrow. Flowers in terminal umbels, which are at first enveloped in and finally subtended by a scarious involucre. Perianth sometimes conspicuous. Sepals and petals 3 each, quite similar in shape, usually membranous, distinct or partially united. Androecium of 6 stamens. Filaments usually distinct. Anthers 2-celled. Gynoecium of 3 united carpels. Ovary superior, 3-celled. Styles united. Ovules 1-several in each cavity. Fruit a loculicidal capsule, 3-lobed, sometimes crested.

Perianth segments distinct:

Ovules 1-2 in each cell, flowers rose.

1. **ALLIUM.**

Ovules several in each cell, flowers yellow.

2. **BLOOMERIA.**

Perianth segments united below into a tube:

Stamens 6, tube sort.

3. **DICHELOSTEMMA.**

Stamens 3, tube long.

4. **HOOKERA.**

1. **ALLIUM L.**

Characteristically odorous herbs, with solitary or clustered bulbs. Leaves basal or mainly so; blades narrow, sometimes hollow or keeled, several. Scapes or stems simple, often hollow. Flowers perfect, in terminal usually simple umbels subtended by 2-3 thin bracts. Perianths of various colors, often white, pink, green or purple, persistent: sepals and petals distinct or nearly so. Stamens 6, adnate to the bases of the sepals and petals: filaments filiform or dilated, sometimes toothed: anthers opening introrsely. Ovary sessile or nearly so, more or less completely 3-celled: style filiform, jointed: stigma somewhat depressed. Ovules 2 in each cavity. Capsule membranous, loculicidal.

1. **A. serratum** Wats. Bot. King. Exped. 487 (1871).

Bulb-coats conspicuously transversely serrate-reticulate; scape usually slender, 20-60 cm. high; leaves very narrowly linear; umbel usually many-flowered and often large, the spreading pedicels 30-76 cm. long; sepals pink or crimson, 10-15 cm long, usually broad and acuminate, erect or recurved, exceeding the stamens; capsule slightly crested.—Quite variable.

On open, grassy eastern slopes. March to May. *Brandegee*; at the Isthmus. *Mills* p. 4830; near Avalon, *Nuttall* 104. **WILD ONION.** The bulbs are eaten raw, or cooked with tunas and cherries. These formed one of the principal fresh vegetable foods of the Aborigines.

2. BLOOMERIA Kell.

Scape from a fibrous coated corni, with linear carinate basal leaves and many yellow flowers in a terminal umbel, subtended by membranous bracts. Pedicels jointed at the summit. Perianth persistent, of 6 nearly equal distinct linear-oblong somewhat spreading segments. Stamens 6, inserted on the base of the segments and a little shorter; filaments filiform with a somewhat cup-shaped winged and often bicuspidate appendage surrounding the base; anthers oblong, attached near the base but versatile. Ovules several in each cell; style filiform-clavate, persistent and splitting with the capsule. Capsule subglobose, membranous, obtusely 3-lobed, loculicidally dehiscent. Seeds sub-ovoid, angular and wrinkled, black.

1. *B. crocea* (Torr.) Coville Contr. Nat. Herb. 4:203 (1893).

Allium croceum Torr. Mex. Bound. 218 (1859).

Bloomeria aurea Kell. Proc. Calif. Acad. 2:11 (1863).

Bulb about 15 cm. in diameter, becoming densely covered with brownish fibres; scape scabrous, 2-5 dm. high; leaf solitary equaling or exceeding the scape, 6-12 mm. broad; bracts narrowly lanceolate; pedicels numerous, 3-6 cm. long; perianth nearly rotate in bloom; segments 8-12 mm. long; appendages about 2 mm. long, bicuspidate, minutely papillose.

Frequent in the foothills on the slopes. April-June. *Brandege*; *Trask*; Vicinity of Avalon: *Smith* 5041; *Mrs. Miller*; *Millsp.* 4895; *Nuttall* 18; *Knopf* 80. GOLDEN STARS.

3. DICHELOSTEMMA Kth.

Scape tortuous or twining from a depressed fibrous coated corni. Leaves usually 2, fleshy, linear. Umbel subtended by 3 or more thin spathaceous bracts. Perianth tube thin, more or less inflated and angular or saccate, about equaled by the segments. Stamens 6, the inner with a free lanceolate appendage on each side, sterile in some species, the outer ones naked; anthers basifixed. Ovules 3-8 in each cell; style persistent, with short divergent stigmas. Capsule ovate to oblong, more or less attenuate above. Seeds angled, black.

1. *D. capitata* (Bth.) Wood, Proc. Am. Nat. Sci. Phila. 1868:173 (1869).

D. insulare (Greene) Burnh. Muhlenb. 3:74 (1907).

Brodiaea insularis Greene, Proc. Calif. Acad. 2:134 (1887).

Brodiaea capitata insularis Macb. Contr. Gray. Herb. n. s. 56:9 (1918).

Scape 1.5-5 dm. high, very tortuous, not rarely twining; leaves

about equaling the scape, carinate; bracts purple, darker than the flowers; flowers several, capitate, clustered on short pedicels 12 mm. long or less; perianth tube funnellform, shorter than the segments; appendages connivant, forming a corona.

Sunny slopes and high ridges, common. January to June. *Trask*; *Brandege* (as *Brodiaea capitata* Bth.); *Grant and Wheeler* 119-6148; *Everman*; *Mills* p. 4553; *Nuttall* 7; *Knopf* 8. WILD HYACINTH, CLUSTER LILY, BLUE DICKS.

Mr. Knopf sends in a specimen (448) collected along the Upper Pebble Beach Road, May 24, 1922, that has a "flower stalk four feet tall and leaf seven feet long."

4. *HOOKERA* Salisb.

Scapes erect, straight from a fibrous-coated corm, with few linear leaves and a solitary umbel subtended by several membranous bracts. Perianth tube thick turbinate, segments equaling the tube, spreading at the tip. Stamens 3, opposite the inner segments, the outer stamens being reduced to staminodia.

1. *H. minor* (Bth.) Britton, Abrams Fl. Los Ang. 80 (1917).
Brodiaea minor Wats. Bot. Calif. 2:153 (1880).

Scape slender, 5-15 cm. high; pedicels 2-5, mostly 2-5 cm. long; perianth about 3 cm. long, violet-purple or paler, its limb rotate, the segments with a strong midvein, the outer narrower, mucronulate; anthers 4-6 mm. long, shorter than the retuse or emarginate staminodia.

Occasional in heavy soil. March-April. We have not met this species either in the field or in collections from Catalina. *Mrs. Trask* says: "rarely seen"; *Brandege* lists it as "common."

Just as we go to press *Mr. Knopf* sends in specimens (423) of this species collected May 14, 1922, in a flat, sandy glade near the stream bed, in the central portion of Bulrush Canyon.

Family 3. LILIACEÆ.

LILY FAMILY.

Scapose or leafy-stemmed herbs from bulbs or corms or rarely with rootstocks or a woody caudex. Leaves various. Flowers solitary or clustered, regular, mostly perfect. Perianth segments 6, distinct. Stamens 6, hypogynous or borne on the perianth or at the base of its segments; anthers 2-celled, mostly introrse. Ovary superior, 3-celled. Ovules few or numerous, in each cavity; styles united; stigma 3-lobed. Fruit a loculicidal capsule; endosperm copious.

Inflorescence racemose.
Inflorescence monoflorous.

1. *CHLOROGALUM*.
2. *CALOCHORTUS*.

1. **CHLOROGALUM** Kth.

Stems from a fibrous-coated bulb, tall, almost leafless, paniculately branched above, the branches loosely racemose. Basal leaves tufted, long-linear, the stem leaves much reduced. Bracts small and scarious. Pedicels jointed at the summit. Perianth white or purplish, persistent and at length twisted over the ovary, its segments distinct, ligulate, spreading, with 3 closely approximate nerves down the middle. Stamens 6, inserted on the base of the segment; anthers versatile. Style long-filiform, slightly 3-cleft. Capsule broadly turbinate, 3-valved, loculicidal. Seeds 1 or 2 in each cell, obovate, somewhat rugose.

1. **C. pomeridianum** (Ker.) Kth. Enum. 4:682 (1843).

Bulbs large, about 1 dm. long, densely and coarsely fibrous-coated; stem and spreading panicle 6-15 dm. high; leaves 2-5 dm. long, 12-30 mm. broad, carinate and undulate; pedicels slender, about 6 mm. long; perianth rotate, its segments 16-20 mm. long, white with purple veins; capsule about 6 mm. long.

Dry hillsides and plains. May-July. *Brandegee*; at the left of Cholla Canyon mouth, *Nuttall* 653. SOAP PLANT, AMOLE. The larger bulbs are utilized as a scrubbing brush—without soap.

2. **CALOCHORTUS** Pursh.

Stems usually flexuous and branching from membranous or rarely fibrous coated corms, with few linear-lanceolate leaves, those of the stems alternate, clasping. Flowers few, showy, terminal on the branches or umbellately fascicled. Perianth deciduous, of 6 distinct more or less concave segments, the inner mostly broadly cuneate-obovate, usually with a conspicuous glandular pit near the base. Stamens 6, inserted on the base of the segments; anthers linear to oblong, basifixed. Ovules many; stigmas sessile, recurved, persistent. Capsule elliptic to oblong.

1. **C. catalinæ** Wats. Bot. Calif. 2:177 (1880).

C. Lyoni Wats. Proc. Am. Acad. 21:455 (1886).

Stems branching, 3-6 dm. high, bulbiferous at base, leaves and bracts linear; sepals ovate-lanceolate, with a broad, thin, transparent margin, purple-spotted near the base, nearly equaling the petals; petals cuneate-obovate, 3-5 cm. high, lilac, with a large ovate purplish blotch at base; gland oblong, yellow or brown, covered with brown or yellowish hairs; anthers obtuse, pinkish, 5 mm. long, on filaments 3 times as long; capsule 2.5-5 cm. long, about 1 cm. wide.

Dry ridges and slopes. April-July. *P. Schumacher*, type in herb. Gray. Both *Lyon* and *Brandege* (listed as *C. Kennedyi* and *C. Palmeri*); *Trask*; *Brandege* (Gray; Field); *Davidson**; *Grant* and *Wheeler* 126a-1847; vicinity of Avalon, *Smith* 4985; *Carlson*; *Nuttall* 6; *Knopf* 87, 102, 213; open field at the Isthmus, *Nuttall* 216; Middle Ranch Canyon, *Nuttall* 598; Cottonwood Canyon, *Knopf* 399. MARIPOSA LILY.

Specimens with white flowers, yellow centered, from Avalon Valley, May 22, 1922; with madder-colored flowers from same locality on same date; with a range of colors from light-lavender to deep-purple, from the Isthmus region, June, 1922—*Knopf* 417, 438, 446.

Order 5. XYRIDALES.

Perennial herbs, or vines. Leaves various; blades very narrow to widely dilated. Flowers perfect or dioecious, complete, regular or irregular. Perianth of 6 parts, sometimes readily distinguishable into calyx and corolla, the members distinct or partially united. Androecium of 3-6 stamens. Gynoecium compound, the ovary wholly inferior or half-inferior. Fruit capsular or baccate. Endosperm horny or fleshy.

Family 1. IXIACEÆ.

SPIDER-WORT FAMILY.

Perennial, mostly caulescent herbs, with bulb-like or elongated rootstocks. Leaves equitant, 2-ranked, commonly elongated. Flowers perfect, regular or irregular, solitary or in clusters from spathe-like bracts. Perianth often highly colored: sepals and petals nearly equal or often very different, withering-persistent or fugacious, distinct, or united below. Androecium of 3 stamens, adnate to the perianth opposite the sepals. Filaments filiform, distinct or partially united. Anthers 2-celled, extrorse. Gynoecium of 3 united carpels. Ovary inferior, 3-celled. Styles distinct, entire or parted, sometimes petal-like. Ovules numerous, anatropous, on central placentae. Fruit a loculicidally 3-valved capsule. Seeds numerous in 1 or 2 rows in each cavity. Embryo straight in the fleshy or horny endosperm.

1. SISYRINCHIUM L.

Perennial mostly tufted slender herbs with fibrous roots from contracted rootstocks, simple or branched 2-winged or 2-edged stems, and linear grass-like leaves. Flowers from terminal spathes consisting of mostly one pair of opposite conduplicate herbaceous bracts

*See his remarks on *Calochortus* in *Erythea* 2:1-2 (1894).

enclosing membranous scales; perianth blue, violet or white with a yellow eye, rarely all yellow, the 6 oblong or obovate segments spreading and aristulate; filaments monadelphous; anthers linear or oblong, the sacs distinct at base; style threadform, the branches filiform or obsolete; ovary 3-celled; capsule globose, oval or obovoid, usually trigonous, loculicidally 3-valved; seeds globose to obovoid, often angled, pitted or smooth. Flowers fugacious, opening successively in sunlight, each usually lasting but a day.

1. **S. bellum** Wats. Proc. Am. Acad. 12:277 (1876).

Stems 2-4 dm. high, glabrous or with scabrous margins, with 1-3 floriferous nodes at the summit; peduncles usually 2 at each node; spathes of 2, nearly equal bracts, scabrous on the keel, 4-7-flowered; perianth deep blue-purple with yellowish base, 2 cm. broad or more; stamens united to near the summit; anthers very small; capsule round-obovoid, 6 mm. high; seeds 1.5 mm thick, obscurely pitted.

Moist, grassy slopes. April-August. Only one clump (of a few plants) seen, that on the bank of Avalon Run beyond the Saw-mill, *Mills* sp. 4735. **BLUE-EYED GRASS.**

Mr. Knopf sends in a depauperate specimen (456) from a "draw" between Johnson's and Parson's, collected June 4, 1922, with the remark: "The only one I have ever seen on the Island."

Sub-class 2. **DICOTYLEDONES.**

Embryo of the seed with two cotyledons (in a few genera one only), the first leaves of the germinating plantlet opposite. Stem exogenous, of pith, wood and bark (endogenous in structure in Nymphaeaceae), the wood in one or more layers surrounding the pith, traversed by medullary rays and covered by the bark. Leaves usually pinnately or palmately veined, the veinlets forming a network. Parts of the flower rarely in 3's or 6's.

CHORIPETALAE—Petals, when present, separate and distinct:

Petals none:

Calyx none.

Herbs. Flowers in spikes.

Order 1. **PIPERALES.**

Shrubs or trees, flowers in aments:

Order 2. **SALICALES.**

Fruit a capsule.

Fruit a nut.

Order 3. **FAGALES.**

Calyx present:

Flowers monoecious, dioecious or polygamous.

Ovary superior, 1-celled.

Order 4. **URTICALES.**

Flowers mostly perfect, ovary superior.

Fruit an achene.

Order 5. **POLYGONALES.**

Fruit not an achene.

Order 6. **CHENOPODIALES.**

Petals present:

Ovary superior, free from the calyx:

Stamens hypogynous, more numerous than the sepals.

Sepals distinct, carpels separate. Order 7. RANALES.

carpels united at base.

Order 8. PAPAVERALES.

Sepals mainly united or confluent with

receptacle.

Order 9. ROSALES.

Stamens as many as the sepals or fewer:

Ovules pendulous.

Raphe toward axis of ovary. Order 10. GERANIALES.

Raphe away from axis of ovary. Order 11. SAPINDALES.

Ovules erect. Stamens very numerous

(except in Violaceae). Order 12. RHAMNALES.

Sepals valvate. Order 13. MALVALES.

Sepals imbricated or convolute. Order 14. HYPERICALES.

Ovary inferior, adnate to the calyx (at least in part):

Plants with barbed or stinging hairs. Order 15. LOASALES.

Plants spiny:

Fleshy, jointed, leafless. Order 16. CACTALES.

Woody, leafy plants.

Ovules several in each cavity of ovary.

Order 17. MYRTALES.

Ovules 1 in each cavity of ovary. Order 18. AMMIALES.

GAMOPETALAE—Petals partly or wholly united

Ovary superior:

Stamens free from the corolla.

Order 19. ERICALES.

Stamens borne on the corolla opposite its lobes.

Order 20. PRIMULALES.

Stamens borne on the corolla alternate with its lobes:

Corolla not scarious, nerved:

Ovaries 2, distinct.

Order 21. GENTIANALES.

Ovary 1, compound (partly divided or

lobed).

Order 22. POLEMONIALES.

Corolla scarious, nerveless.

Order 23. PLANTAGINALES.

Ovary inferior:

Anthers distinct.

Order 24. RUBIALES.

Anthers united (except in Ambrosiaceae).

Order 25. CAMPANULALES.

Order 1. PIPERALES.

Dicotyledonous plants, with neither petals nor sepals, the spicate flowers bracteolate.

Family 1. SAURURACEÆ.

LIZZARD-TAIL FAMILY.

Perennial herbs with broad entire alternate petioled leaves and small perfect bracteolate flowers in peduncled spikes. Perianth none. Stamens 6-8 or sometimes fewer, hypogynous; anthers 2-celled, the sacs longitudinally dehiscent. Ovary 3-4 carpelled; the carpels distinct or united, 1-2-ovuled; ovules orthotropous. Fruit capsular or berry-like, composed of 3-4 mostly indehiscent carpels. Seeds globose or ovoid; endosperm copious, mealy; embryo minute, cordate.

I. ANEMOPSIS Hook.

Stems nodose, scape-like, stoloniferous from aromatic creeping rootstocks. Leaves mostly radical, minutely punctate. Flowers in a compact spike surrounded at the base by a persistent colored involucre of 5-8 bracts; each flower except the lowest also surrounded by a small colored bract. Stamens 6-8. Ovary sunk in the rachis of the spike, 1-celled; stigmas 3-4. Capsule dehiscent at the apex.

1. *A. californica* H. and A. Bot. Beech. Voy. 390 (1841).

Houttuynia californica (Nutt.) Bth. & Hook. f. Gen. Pl. 3:128 (1880).

Stem 15-50 cm. long, with a broadly ovate clasping leaf above the middle and a fascicle of 1-3 small petioled leaves in the axil; basal leaves elliptic-oblong, rounded above, more or less narrowed toward the cordate base, 5-15 cm. long, on petioles 10-20 cm. long; spikes 1.5-4 cm. long; involucre bracts white, often reddish beneath, oblong, 1-3 cm. long; floral bracts white, obovate, unguiculate, 5-6 mm. long; ovules 6-10 on each placenta.

Wet, saline places. March-August. *Brandegee* includes this species in his list of Santa Catalina Island plants. We have seen no specimen of it as from there YERBA MANSA.

Order 2. SALICALES.

Trees or shrubs, with imperfect small flowers in aments. Sepals and petals none. Leaves simple. Fruit a many-seeded capsule. Seeds with a tuft of hairs at one end.

Family 1. SALICACEÆ.

WILLOW FAMILY

Dioecious trees or shrubs with light wood, bitter bark, brittle twigs, and alternate stipulate leaves, the stipules often minute and caducous. Flowers solitary in the axil of each bract. Staminate flowers consisting of from one to numerous stamens inserted on the receptacle, subtended by a gland-like or cup-shaped disk; anthers 2-celled, the sacs longitudinally dehiscent. Pistillate aments sometimes raceme-like; pistillate flowers of a 1-celled ovary subtended by a minute disk; placentae 2-4, parietal; ovules usually numerous, anatropous; stigmas 2-4, simple or 2-4-cleft. Seeds small or minute, provided with a dense coma of long, mostly white, silky hairs. Endosperm none. Cotyledons plano-convex. Radicle short.

Bracts fimbriate stamens numerous.
Bracts entire, stamens 2-10.

1. *POPULUS*.
2. *SALIX*.

1. **POPULUS L.**

Trees with scaly resinous buds, and usually long-petioled leaves, the stipules minute, fugacious. Disk cup-shaped, oblique. Staminate aments dense, pendulous. Staminate flowers with from 4 to 60 stamens, their filaments distinct. Pistillate aments sometimes raceme-like through the elongation of the pedicels. Ovary sessile; style short; stigmas 2-4, entire or 4-lobed. Capsule 2-4 valved. Coma of the seeds often very long and conspicuous.

1. **P. trichocarpa** T. & G. Hook. Icon. 9: pl. 878 (1852).

Tree with a broad head of ascending branches, 8-15 m. high; leaves ovate or oblong-ovate, rounded at the base, acute at apex, serrulate, dark green and shining above, pale beneath, 5-8 cm. long, on terete petioles, 3-5 cm. long; staminate aments 3-5 cm. long; disk oblique, bearing 40-60 stamens, with purple anthers; pistillate aments 5-7 cm. long, loosely flowered; ovary hoary tomentose; capsule 3-valved.

Canyon bottoms near streamlets. February to April. *Brandegec*; Lyon (Gray, Field); *Trask*; Swain's Canyon, largest tree 65 feet high with a trunk 10 feet 6 inches in diameter, *Jepson* 3060; Gallaghers Canyon, *Eastwood* 6460; *Mills* 4591; Cape Canyon, *Mills* 4674; Banning and Pebble Beach Canyon, *Knopf* 240, 242; Cottonwood Canyon, *Knopf* 402. COTTONWOOD, BLACK COTTONWOOD, BALSAM COTTONWOOD.

2. **SALIX L.**

Trees or shrubs with mostly long narrow usually acute leaves, and persistent or early deciduous broad or minute stipules. Bracts entire or denticulate. Disk gland-like, small or minute. Staminate aments dense, erect, spreading or drooping, their flowers with 1-11 stamens with filaments distinct or sometimes united below. Pistillate usually erect or spreading; ovary sessile or short-stipitate; style short or filiform, with 2 entire or 2-cleft stigmas. Capsule mostly 2-valved.

Stamens 3.

Stamens 2.

Aments racemose on the branchlets.

Aments terminating the branchlets.

1. *laevigata*.2. *lasiolepis*.3. *argophylla*.1. **S. laevigata** Bebb, Am. Nat. 8: 202 (1874).

Tree 10-15 m. high; branches reddish-brown; leaves lanceolate to oblong-lanceolate, serrulate, green and shining above, more or less glaucous beneath, 8-12 cm. long, glabrous. Petioles about 1 cm. long; puberulent above and somewhat grooved; staminate aments usually flexuous, 5-7.5 cm. long; bracts more or less elliptic, woolly at base, glabrous and pallid toward the apex; stamens 5-6; filaments pubescent

below; capsule conic from a thick base, acute, glabrous, on pedicels 3-4 times as long as the gland; stigma nearly or quite sessile, emarginate.

Along rivulets in canyons. Listed by *Lyon* and by *Brandegee*, but the only specimen we have seen is *Mrs. Trask's*, in herb. N. Y. Bot. Gard., of which she says "less frequent than *S. lasiolepis*." Although we searched widely for this species we did not succeed in locating it. RED WILLOW.

2. ***S. lasiolepis*** Bth. Pl. Hartw. 335 (1857).

Tree or large shrub, 4-8 m. high; leaves oblong or somewhat broadest above the middle, obscurely and irregularly serrulate, dull green above, more or less gray-pubescent beneath, 12-20 mm. broad, 5-7 cm. long, on petioles 5-10 mm. long; aments appearing before the leaves, sub-erect; the staminate 2-4 cm. long; stamens 2; pistillate 2.5 cm. long or less; capsule acute, smooth, short pedicelled; styles rather short; stigmas erect.

Common along streamlets both in canyon beds and on high lands. January to March. *Trask* (N. Y., Field); *Swain's Canyon*, *Jepson* 3053; *Rock Spring and Cherry Canyons*, *Smith* 5080, 5102; *Avalon Valley*, *Millsp.* 4505 and *Middle Ranch Canyon* 4572, 4577, *Knopf* 320, 362; *Avalon Canyon*, *Nuttall* 1061, *Big Wash Canyon* 702, 1127, *Hamilton Canyon* 230, 1031; *Knopf*, 270, 277, 280, 333a; ARROYA or WHITE WILLOW.

The aborigines made a liniment from an extract of this species, for use as a remedy for rheumatism.

3. ***S. argophylla*** Nutt. Sylv. 1: 71 (1842).

Slender shrub, stem one from the base, strictly erect or sometimes straggling, 12.2-36.6 dm. high; foliage lustrous silvery-tomentose; leaves linear, acute at apex or long-pointed, entire, 1.9-6.3 cm. long, 2.1-4.2 mm. wide; catkins on leafy peduncles; staminate catkins 1.2-2.7 cm. long, 6.3 mm. thick, in bud usually conical, the green-tipped scales often abruptly acute; pistillate catkins 12.7-19.0 mm. long, 3.2-4.2 mm. thick; ovary silky; stigmas oblong, sessile, the top of the ovary sometimes bulbous-dilated just below them; capsule silvery-tomentose, brown.

Canyon stream bed. May. Evidently rare as it has only once been collected, that by *Nuttall* 343, in *Big Wash Canyon*. COYOTE WILLOW.

Order 3. FAGALES.

Trees or shrubs, with small monoecious or rarely dioecious flowers in aments, or the pistillate ones subtended by an involucre, which becomes a bur or cup in fruit. Calyx usually present. Corolla none. Endosperm none.

Family 1. FAGACEÆ.

OAK FAMILY.

Trees or shrubs. Leaves alternate, petioled, pinnately veined, the stipules, if any, deciduous. Flowers small, monoecious, the staminate

in aments, or capitate, the pistillate subtended by an involucre of partly or wholly united bracts, which becomes a bur or cup. Petals none. Staminate flowers with a 4-7-lobed perianth and 4-20 stamens; filaments slender, distinct, simple; anther-sacs adnate, longitudinally dehiscent. Pistillate flowers with a 4-8-lobed urn-shaped or oblong perianth, adnate to the 3-7-celled ovary; ovules 1-2 in each cavity, only 1 in each ovary ripening, pendulous, anatropous; styles as many as the cavities of the ovary, linear. Fruit a 1-seeded nut, with a coriaceous or somewhat bony exocarp. Testa thin. Endosperm none, cotyledons large, fleshy, often rugose; radicle short.

1. QUERCUS* L.

Trees or shrubs, with pinnatifid lobed, dentate, crenate or entire leaves, deciduous, or in some species persistent. Flowers very small, green or yellowish, appearing with or before the leaves, the staminate numerous in slender, mostly drooping aments, the pistillate solitary in many-bracted involucre. Staminate flowers subtended by caducous bracts, consisting of a mostly 6-lobed campanulate perianth and 6-12 stamens with filiform filaments, sometimes also with an abortive pilose ovary. Pistillate flowers with an urn-shaped or oblong calyx, adnate to a mostly 3-celled ovary; ovules 2 in each cavity of the ovary, rarely more than 1 in each ovary maturing; styles as many as the ovary-cavities, short. Fruit consisting of the imbricated and more or less united bracts of the involucre (cup), subtending or nearly enclosing the ovoid, oblong or subglobose, 1-seeded coriaceous nut (acorn).

Acorn maturing the first year, the shell not woolly within:
abortive ovules at its base:

Leaves entire or variously toothed, not lobed, deciduous.

Leaves lobed, larger, evergreen. 1. *dumosa*.

2. *MacDonaldii*.

Acorn maturing the second year, the shell woolly within:
abortive ovules toward its top:

Leaves glabrous, often entire. 3. *chrysolepis*.

Leaves somewhat hairy, commonly toothed. 4. *tomentella*.

1. *Q. dumosa* Nutt. N. A. Sylv. 1:7 (1842).

Shrub or small tree 15 dm.-7 m. high with pale gray bark and tomentose branchlets; leaves coriaceous, broadly or narrowly oblong, 2.6 cm. long more or less, spinose-serrate and sometimes sinuate or irregularly incised; staminate aments 7.6 cm. long; acorns 2 together

*By William Trelease.

or solitary nut oval, mostly pointed, 12.7-33.3 mm. long; cup hemispherical, strongly tuberculate at base, scales free above with minute hairy tips.

Everywhere, February to April. *Lyon*; *Trask* (one specimen as *Q. Douglasii*); *Toumey*; *Palmer* (8), (9), 255, (his 8) and 255 approach *Q. Alvordiana*, 256; *Rusby* (as *Q. agrifolia* but prox *Q. Alvordiana*); vicinity of Avalon, *Eastwood* 6525 (prox. *Q. Alvordiana*); *Jepson* 3043 and at the head of Swain's Canyon, 3052; *Hay Press*, *Hall* 8275; *Avalon Valley*, *Pendleton* 1386; *Coach Road*, *Cherry Canyon*, and foot of *Black Jack*, *Smith* 5028, 5091, 5171; *Middle Ranch Canyon*, *Millsp.* 4576; *Chicken Johnny's* and *Silver Canyon*, *Nuttall* 149, 583, 584, 740, (584, 740 approach *Q. MacDonaldii*); *Big Wash Canyon*, *Nuttall* 725, *Knopf* 233, 318; *Pebble Beach Canyon* and the *Summit*, *Knopf* 199, 321, 329. SCRUB OAK. The prevalent oak, if not the prevalent tree, of the island.

Even more, than before seeing this large and instructive range of good specimens from Catalina Island, I feel that it is nearly hopeless to try to segregate the forms of *dumosa*, and that the "species" represents an ancient complex of various differentiated but inter-breeding and inconstant initials of what might have become differentiable species if isolated. The ensemble comes pretty close to repeating *Von Ettingshausen's* story of *Quercus Paleoilex* and its European descendants.

Among the races represented on the island, there, are, however, three that may well be considered to be forms:

forma insularis: with small ovate leaves, 15-25 x 6-14 mm., with a smooth upper surface, often entire or with a few shallow crenulations, or with sparse, broad and shallow teeth; nuts elongate, pointed, about 3 x 1.2 cm. with very small cups. The *Wishbone*, *Smith* 5029, *Knopf* 334; *Millsp.* 4582, 4583 (prox *Q. Alvordiana*), and in a hollow east of the terminus of *Bishop Street*, *Avalon*, *Nuttall* 120 (prox *Q. Alvordiana*), 1202.

forma myrtifolia: with oblanceolate to ovate leaves, 1.8-4 x 0.6-1.8 cm., the upper surface strongly raised-reticulate-veined, the margins entire or infrequently sharp, spinose-tipped toothed. Acorns not seen. *Cherry Valley* at the bend of the *Coach Road*, *Millsp.* 4823; *Big Wash* and *Rock Falls Canyons*, *Nuttall*, 356, 585.

forma longigemma: with narrowly-lanceolate leaves, 1.5-2 x .05-.07 cm., the upper surface very finely-low-reticulate-veined, the margin entire or sparingly low-crenate, with now and then individual leaves with 1-3, small, spinose teeth. Cup large, acorn ovate, pointed, about 2.5 x 1.8 cm. A low, spreading tree with a trunk 15.3 cm. in diameter, in the canyon south of *Chicken Johnny's* *Millsp.* 4545.

2. *Q. MacDonaldii* Greene, W. Am. Oaks, 25, 73, t. 34 (1889).

Leaves spatulate-oblong, pinnately lobed, with acute lobes tipped with sharp points, 6.3 cm. long; lower surface densely clothed with star-shaped hairs; smooth on the upper; base generally unequal and obtuse. Fruit matures in one season; sessile, less than 2.6 cm. long; the nut ovate-oblong, acute, cup rather deep, tuberculate. Small evergreen tree, 4.5-10.6 cm. high; symmetrical and graceful with rounded top and slender branches.

In groves of a few trees in the upper part of the moister canyon beds. February to April. *Lyon* (as *Q. Douglasii*); *Trask*, "25 to 50 feet high, 1 to 3 feet in diameter of trunk;" *Brandege* (as *Q. Douglasii*, *Q. Engelmannii*, *Q. MacDonaldii elegantula*); *Jepson* 3058 he says in his notes: "single trunks up to 20 inches in diameter, tree 40 feet high;" *Grand Canyon*, *Hall* 8276; *Summit*, *Eastwood* 6519; *Toumey*; *Cherry Canyon*, *Smith* 5092; *Big Wash Canyon*, *Nuttall* 741, 742, 1200, and *Rocky Falls Canyon* 357; *Middle Ranch*, *Millsp.* 4607,

Knopf 263; Pebble Beach Canyon, a small grove at the camp site, *Millsp. Knopf* 241 "trees up to 50 feet." ISLAND OAK, BLUE OAK, LIVE OAK, EVERGREEN OAK. Variouslly reported as *Q. oblongifolia*, *Q. dumosa* *McDonaldii* and *Q. Morehus*. This species also shows many races having an enormous range between the typical oblong and the most striking elliptic foliage; they appear to present a hopeless series of intergradients, as the heavy-myrtle leaved foliage passes into the thinner, more typical, and the rounded forms.

3. *Q. chrysolepsis* Liebm.? Dansk. Vid. Foreh. 1854:173 (1854).

Tree 9.15-12.15 m. high, or on exposed mountain summits a shrub 1.2-3 m. high (in such situations often gregarious); leaves oblong or narrowly-ovate to elliptical, cordate to cuneate at base, acute or cuspidate at apex, mostly entire on old trees, spinose-dentate on young ones or on vigorous shoots, pale and glaucous above, fulvous-tomentose or gray-pubescent below, at length glabrate; staminate aments 5.1-10.1 cm. long, the calyx with 4 to 7 ovate, acute lobes; acorn usually solitary; nut oval or ovate, 1.2-5.1 cm. long; cup shallow, the tubercles and scales almost completely concealed by a close dense tomentum.

Rare. *Mrs. Trask* says: "a few trees in one locality at an altitude of 1800 feet." March to April. *Trask* "tree 20 feet high with a trunk up to 8 inches in diameter;" gulley near the base of Black Jack, *Nuttall* 1201. GOLDEN LEAVED OAK, LIVE OAK.

The more I see of the Catalina forms of *chrysolepis* (that other very ancient form), the less easy I find it to separate *tomentella* from *chrysolepis*. On the island we find as large if not quite as hairy leaves as in the most representative type of *tomentella* and nearly as small and glaucous leaves as in the extreme *vaccinifolia*. I never could call *Mrs. Trask's* specimen *tomentella*; and *Trask* 340222 in the National Herbarium, is perhaps as separable. On the whole my present idea is to hold these coastwise island forms as paralleling the *dumosa* range of island forms—the extreme of which is the isolated *Guadalupe tomentella*. On this basis, I should be disposed to unite all of these Catalina specimens as a var. *conjungens* of *tomentella*—if only they did not comprise the small glaucous form.

4. *Q. tomentella* Engelm. Tr. St. Louis Acad. 3:393 (1877). (Plate VII.)

A tree, 9-12 m. or occasionally 18.2 m. high, with a trunk 3.3-6.8 dm. in diameter. Leaves oblong-lanceolate, acute, sometimes cuspidate or occasionally rounded at apex, broad and rounded or gradually narrowed and abruptly cuneate at base, remotely crenate-dentate with small remote spreading callous-tipped teeth, or entire, when they unfold, light green tinged with red, covered above with scattered pale fascicled hairs and below and on the petioles with thick hoary tomentum, at maturity thick and coriaceous, dark green, glabrous and lustrous on the upper surface, pale and covered with fascicled hairs on the lower surface, 5.1-10.1 cm. long, 2.6-5.1 cm. wide, with thickened strongly revolute margins, and a pubescent midrib; gradually deciduous during their third season; petioles stout, pubescent, about 12.7 mm. in length. Flowers: staminate in pubescent aments 6.3-35.8 cm. long, calyx light yellow, pubescent, divided into 5-7 ovate acute lobes; pistillate subsessile or in few-flowered spikes on short or elongated pubescent peduncles, their involucreal scales like the calyx

coated with fascicled hairs; stigmas red. Fruit subsessile or short-stalked; nut ovoid, broad at base, full and rounded at apex, about 3.8 cm. long and 19.0 mm. thick, inclosed only at base in a cup-shaped shallow cup thickened below, light brown and pubescent on the inner surface, and covered by thin ovate acute scales, their free chestnut-brown tips more or less hidden in a thick coat of hoary tomentum.

The Catalina tree very closely approaches *Q. chrysolepis*.

In the deeper and moister canyons, frequent. February to April. *Lyon*; *Trask* "in a canyon near the middle of the island, trees over 50 feet high"; *Brandege*; *Toumey*; Hay Press, *Hall* 8274; *Gallagher's Canyon*, *Jepson* 3056; *Cherry Canyon*, *Smith* 5118; *Pebble Beach Canyon*, *Mills* 4686, *Nuttall* 274, *Knopf* 260; *Banning's Canyon*, *Nuttall* 333; *Middle Ranch*, *Knopf* 185; *Bulrush Canyon*, *Knopf* 351, 416; *Pacific Slope of the Salta Verde*, *Knopf* 367. ISLAND OAK.

Order 4. URTICALES.

Trees, shrubs or herbs, the flowers with a calyx but without corolla, small, not borne in aments, monœcious, diœcious or polygamous; ovary 1-celled, superior.

Family I. URTICACEÆ.

NETTLE FAMILY

Herbs (some tropical species shrubs or trees), with watery sap, mostly stipulate simple leaves, and small greenish diœcious, monœcious or polygamous flowers, variously clustered. Calyx 2-5-cleft, or of distinct sepals. Petals none. Stamens in the staminate flowers as many as the lobes or segments of the calyx (sepals) and opposite them, the filaments inflexed and anthers reversed in the bud, straightening at anthesis. Ovary superior, 1-celled; style simple; ovule solitary, erect or ascending, orthotropous, or in some genera partly amphitropous. Fruit an achene. Endosperm oily, usually not copious; embryo straight.

Leaves opposite, dentate:

Pistillate calyx 4-parted

Pistillate calyx 2-4-toothed

Leaves alternate, entire

1. URTICA.
2. HESPEROCNIDE.
3. PARIETARIA.

I. URTICA L.

Annual or perennial herbs with stinging hairs. Leaves opposite, petioled, 3 to 7-nerved, with stipules. Flowers in ours monœcious, clustered, the clusters in axillary, often branching spikes. Staminate flower with 4 sepals, 4 stamens and a cup-shaped rudiment of a pistil. Pistillate calyx with the sepals unequal, the exterior smaller than the inner and at length enclosing the flattened achene; ovary with sessile tufted or almost feathery stigma. Endosperm scanty.

- | | |
|--|-------------------------|
| Annuals, male and female flowers intermixed: | 1. <i>urens</i> . |
| Perennials, male and female flowers in
separate spikes: | 2. <i>holosericea</i> . |

1. *U. urens*, Linn. Sp. Pl. 934 (1753).

Erect, branching from the base or sometimes simple, 25-50 cm. high; leaves ovate or oblong-ovate, deeply and sometimes doubly serrate, 1-4 cm. long, on slender petioles of about the same length; stipules 4 mm. long; flower clusters rather dense, mostly shorter than the petioles; flowers androgynous, mainly pistillate.

Shady waste places. January to June. *Lyon, Brandegee* (lists); Avalon Valley, *Smith 5011*; *Millsp. 4568*; matting the ground in large areas in a cactus opening, Cape Canyon, *Millsp. 4673*, and under cherry trees, Cherry Valley 4798. STINGING NETTLE.

2. *U. holosericea* Nutt. Jour. Phil. Acad. n. s. 1:183 (1847).

U. gracilis holosericea Jeps. Fl. Calif. 2:367 (1909).

Stems simple, stout, 1-3 m. high or more, more or less bristly and finely pubescent; leaves finely and densely pubescent beneath, less so above or with only a few scattering bristles, ovate to lanceolate, 5-10 cm. long, the upper much shorter, on petioles $\frac{1}{4}$ as long, coarsely serrate; stipules narrowly oblong, acute or obtuse, 6-10 mm. long; staminate flower clusters rather loose, nearly equaling the leaves; pistillate denser and shorter; inner sepals ovate, densely hispid, 1 mm. long, about equaling the broadly ovate achene.

Along streams. May to September. *Lyon, Brandegee* lists; Middle Ranch Canyon, *Smith 5114*, *Nuttall 311*; *Knopf 267*. TALL NETTLE.

2. HESPEROCNIDE Torr.

Annual herbs distinguished from *Urtica* by the pistillate perianth, which is a membranous flattened oblong-ovate sac, with a minutely 2-4-toothed orifice.

1. *H. tenella* Torr. Pacif. R. Rept. 4:139 (1857).

Slender and weak, 25-50 cm. high, simple or branched, somewhat hispid with branching hairs and bristly; leaves 1-3 cm. long, thin, ovate, obtusely serrate; petioles slender, $\frac{1}{2}$ as long; flower clusters rather dense, nearly glomerate, shorter than the petioles; calyx thin, hispid, with hooked hairs, in fruit 1-1.5 mm. long; achene membranous, striately tuberculate with minutely rough points.

Rich, sandy loam in shady canyon bottoms. March to June. *Brandegee* list; Cherry Valley, *Millsp. 4802*; Hamilton Canyon, *Nuttall 227*. COAST NETTLE.

3. PARIETARIA, L.

Ours slender annuals without stinging hairs. Leaves alternate, entire, 3-nerved, petioled, without stipules. Flowers in axillary

glomerate clusters, polygamous, subtended by leafy bracts. Calyx of the perfect flowers 4-parted, in the pistillate tubular-ventricose, 4-cleft with connivent lobes. Style slender or none; stigma spatulate, recurved, densely tufted. Achene ovoid, smooth and shining, enclosed in the dry, brownish, nerved calyx.

1. *P. debilis* Forst. Ins. Austr. Prodr. 73 (1786).

Very slender, usually diffusely branching from the base, 10-25 cm. high, somewhat hispid; leaves 5-10 mm. long or more, broadly ovate, obtuse, rounded at the base or abruptly cuneate; petioles slender, about equaling the leaves; achene 1 mm. long.

Damp, shady places in canyons. March to May. *Lyon 60* (Gray; Field); *Brandegge list*; *Cherry Valley, Millsp. 4801, 4804*; *Descanso Canyon, Nuttall 176, 1155*. PELLITORY.

Order 5. POLYGONALES.

Herbs, twining vines, shrubs or trees, with alternate, or sometimes opposite or whorled, simple mostly entire leaves, jointed stems, and usually sheathing united stipules (ocreæ). Flowers small, regular, perfect, diœcious, monœcious or polygamous. Petals none. Calyx inferior, 2-6-cleft or 2-6-parted, the segments or sepals more or less imbricated, sometimes petaloid, sometimes developing wings in fruit. Stamens 2-9, inserted near the base of the calyx; filaments filiform or subulate, often dilated at the base, distinct or united into a ring; anthers 2-celled, the sacs longitudinally dehiscent. Ovary superior, 1-celled; ovule solitary, orthotropous, erect or pendulous; style 2-3-cleft or 2-3-parted, sometimes very short; stigmas capitate or tufted, rarely 2-cleft; fruit a lenticular 3-angled or rarely 4-angled achene, usually invested by the persistent calyx; endosperm mealy; cotyledons accumbent or incumbent; embryo straight or nearly so. Only the following family.

Family 1. POLYGONACEÆ.

SMARTWEED FAMILY

Characters of the order:

Leaves destitute of sheathing stipules:

Involucre with distinct bracts or none.

Bracts present.

Bracts wanting.

Involucre turbinate or campanulate.

Teeth of involucre cuspidate or awned

Teeth of involucre not awned.

Leaves with sheathing stipules.

Sepals 6 the outer 3 smaller.

Sepals 4-5 similar.

1. *PTEROSTEGIA*.

2. *LASTARRIAEA*.

3. *CHORIZANTHE*.

4. *ERIOGONUM*.

5. *RUMEX*.

6. *POLYGONUM*.

1. **PTEROSTEGIA** F. & Mey.

Very slender annuals, diffusely dichotomous from the base, with opposite leaves and foliaceous bracts. Involucres axillary, sessile, solitary, consisting of a single 2-lobed bract, shorter than the solitary sessile flower, enlarged in fruit, scarious and reticulated, loosely enclosing the achene, gibbously 2-saccate on the back. Calyx 6-parted or rarely 5-parted. Stamens 3-6, inserted at the base of the calyx-lobes. Achene triangular, glabrous; cotyledons accumbent.

1. **P. drymarioides** F. & M. Ind. Sem. Hort. Petrop. 2:48 (1835).

Stems several from the base, 10-30 cm. long or more; lower leaves petioled, 4-12 mm. long, fan-shaped, 2-lobed, the lobes crenately toothed or slightly lobed; upper leaves obovate-spatulate, entire or more or less toothed; bracts similar, 2 mm. long; involucres 2-3 mm. long in fruit, the margins of the lobes toothed or lacinate; flowers about 1.5 mm. long, sessile; calyx-lobes lanceolate.

Dry situations especially among beach pebbles where the plants are bright madder color. March to June. *Lyon* and *Brandegee* lists. Among dry beach pebbles mouth of Cherry Valley, *Mills* sp. 1807; along the Equestrian Trail, *Nuttall* 731, 157.

2. **LASTARRIÆA** Remy.

A small diffuse rigid fragile annual, with the aspect of *Chorizanthe*. Involucre wanting. Perianth involucre-like, coriaceous, tubular, 5-6-cleft to the middle; the narrow teeth rigid, awned, recurved and uncinat. Stamens 3, inserted on the throat; filaments very short, with small membranous appendages intervening at their insertions. Achene triangular; embryo curved.

1. **L. chilensis** Remy. Gay. Fl. Chil. 5:290 (1849).

Branches procumbent or ascending, 5-15 cm. long, hirsute; lowest leaves linear, obtuse, hispid-ciliate, 1-2 cm. long, cauline in whorls of 4-5, unequal; tracts 3-6 mm. long, concealing the flowers; perianth 2-3 mm. long, its tube triquetrous; teeth 5, 3 long and 2 short; anthers small, orbicular; style very short.

Dry hillsides in loose soil. March to May. *Brandegee* list; "common in one canyon where it forms a dense mat on the ground"—*Trask*. (N. Y. Field).

3. **CHORIZANTHE** R. Br.

Low dichotomously branched annual herbs, with rosulate basal leaves and opposite or ternate stem-leaves, often reduced and bracteate. Involucre 1-flowered, or rarely 2-3-flowered, tubular or funnelform, sessile, 3-6-angled or costate, 3-6-toothed or 3-6-cleft,

its teeth divaricate, cuspidate or awned. Flowers pedicellate or nearly sessile, included within the involucre, or the segments protruding. Calyx 6-parted or 6-cleft, colored. Stamens usually 9, rarely 3 or 6. adnate to the base of the calyx-tube. Ovary glabrous.

1. **C. staticoides** Bth. Tr. Linn. Soc. 17:418 (1837).

Erect or decumbent, rather stout, 1-4 dm. high, with spreading branches, villous-pubescent, often purplish, leaves all basal, tomentose beneath, oblong, obtuse, 2.5-6 cm. long; bracts not acerose; involucre in rather close cymes, 3-6 mm. long, the alternate teeth larger, nearly equal; flowers nearly sessile, 4-5 mm. long, glabrous or sparsely villous on the midvein, cleft to near the middle; segments oblong, entire, the alternate ones about half as long and narrower; stamens inserted at base.

On dry slopes. March to June. *Lyon* (Gray; Field); *Trask* (N. Y. Field); *Brandegee* list only.

4. **ERIOGONUM**, Michx.

Annual or perennial herbs or rarely shrubs, with basal, alternate or verticillate leaves, without stipules, and perfect involucre flowers. Involucre campanulate, turbinate or oblong, 4-8-toothed or 4-8-lobed, awnless, usually many-flowered; the more or less exerted pedicels intermixed with scarious narrow setaceous bracts or bractlets. Perianth 6-parted or deeply 6-cleft, petaloid. Stamens 9, inserted on the base of the perianth. Styles 3; stigmas capitate. Achene triangular, rarely lenticular.

Cyme leafy, densely flowered.
Cyme leafless, openly flowered.

1. *giganteum*.
2. *nudum*.

1. **E. giganteum** Wats. Proc. Am. Acad. 20:371 (1885).

Freely branching shrub 1.5-23 m. high, bearing its white foliage towards the ends of the tomentose or glabrate branches; trunk with rough bark, 5 to 20 cm. in diameter; leaves leathery, ovate, obtuse, 5-13 cm. long, white-lanate on both sides or glabrate above, strongly veined beneath, the petioles 2.5 to 5 cm. long; peduncles stout, bearing a dense tri- or di-chotomously branched compound cyme 10 to 60 cm. broad; involucre sessile or pedicellate, somewhat crowded on the branchlets, campanulate with very low teeth, almost as if truncate, 6 mm. long, densely close-woolly outside; calyx 3 mm. long, densely white-hairy toward the cuneate base, its segments broadly obovate, rounded at apex, the inner narrower; filaments pubescent at base.

Dry, open slopes especially near the sea. May to September. *Lyon & Nevin* (Type, Gray); "12 feet high with a trunk a foot in diameter"—*Trask* (N. Y.; Field); *Palmer*; *Toumey*; near Avalon, *McClatchie*; *Brandegee*

(Calif.; Field); Smith 5013, 5170; Eastwood 6447; McBride & Payson 840; Pendleton 1354, 1383; Hasse (Field); Mills^{sp.} 4892; Nuttall 566, 793; Knopf 168. QUEEN ANNE'S LACE.

2. *E. nudum* Dougl. Bth. Tr. Linn. Soc. 17:413 (1837). Pl. XIV f. 2.
Erigonum grande Greene, Pitton. 1:38 (1887).
Eriogonum rubescens Greene, *ibid.* 39.

Caudex sparingly leafy; scapes rather slender, fistulose, 3-6 dm. high, sparingly branched above; leaves broadly ovate or oblong, obtuse, 1-5 cm. long, on slender petioles, undulate, densely tomentose beneath, becoming glabrate above; involucre usually 3-6 in each cluster, glabrous or nearly so, 4-6 mm. high; flowers glabrous or somewhat villous, 2-3 mm. long, white or rose color.

Dry slopes, especially near the sea. June to January. Lyon 3; Trask; Brandegee list; McClatchie; Blake 970; Macbride & Payson 856; Mills^{sp.} 4472; Nuttall 706, 713, 1162; Knopf 193, 223. TIBINAGUA WILD BUCKWHEAT.

5. RUMEX L.

Perennial or annual leafy-stemmed herbs. Stem grooved, usually branched. Leaves entire or undulate, flat or crisped, with scarious obliquely truncate cylindric sheathing stipules. Flowers green, usually perfect, in a simple or compound often paniced raceme. Calyx 6-parted, the 3 outer sepals unchanged in fruit, the 3 inner ones (wings) usually bearing a grain-like callosity on the back, larger and enclosing the achene. Stamens 6; filaments short, glabrous; anthers oblong. Style 3-parted; stigmas peltate, tufted. Achenes 3-angled.

Wings undulate or subdentate 2 mm. long.

Wings cordate 3-4 mm. long.

1. *salicifolius*.

2. *crispus*.

1. *R. salicifolius* Weinm. Flora 4:28 (1821).

Glabrous and somewhat glaucous; stems ascending or spreading, simple or branched, grooved, flexuous, 4-8 dm. long; leaves mostly lanceolate, acute or acuminate, petioled, not undulate or crisped; racemes dense, interrupted below in fruit; flowers in dense clusters; wings 2 mm. long, undulate or subdentate, each bearing a large ovoid grain; achene 2 mm. long, dark red.

In moist situations. May to August. Lyon and Brandegee lists; Middle Ranch Canyon, Smith 5111, Nuttall 326; Cottonwood Creek, Nuttall 854; Knopf 226. WILLOW DOCK.

2. *R. crispus* Linn. Sp. Pl. 335 (1753).

Stems simple or branched above, erect, rather slender, 3-10 dm. high; leaves crisped and undulate, the lower oblong or oblong-lanceolate, 15-30 cm. long, long petioled, the upper narrowly oblong or lanceolate, short petioled, all cordate or obtuse at base; panicle

rather open; racemes simple or compound; flowers rather loosely whorled; calyx green; fruiting pedicels about twice the length of the wings, jointed near the base; wings cordate, 3-4 mm. long, truncate or notched at base, erose-dentate or nearly entire, each bearing a grain; achene 2 mm. long, dark brown.

Moist places. May to September. Near Avalon, *McClatchie*; Fourth o' July, *Mills* 4793; Middle Ranch below the buildings, *Nuttall* 895. CURLED DOCK.

6. POLYGONUM L.

Annual or perennial, terrestrial or aquatic herbs, some species woody, with erect prostrate, climbing or floating stems, alternate entire leaves, continuous with, or jointed to the cylindric funnel-form or two-lobed, often lacerate or fringed ocreæ; Flowers normally perfect, green, white, pink or purple, variously clustered, the clusters terminal or axillary. Pedicels jointed, subtended by ocreæ or ocreolæ; calyx 4-5-parted or 4-5-cleft, the outer sepals or segments somewhat larger than the inner: stamens 5-9, included or exserted; filaments filiform or dilated at the base, glabrous; style 2-3-parted or 2-3-cleft, its branches included or exserted; stigmas capitate; achene lenticular or 3-angled (rarely 4-angled), invested by or exceeding the calyx. Embryo near the end of the seed in one of its angles.

1. *P. aviculare* Linn. Sp. Pl. 362 (1753).

Annual or commonly perennial, slender, glabrous, dull green or bluish green; stem prostrate or ascending, 1-7 dm. long. Leaves oblong, linear or oblanceolate, 0.5-2 cm. long, jointed to the ocreæ, narrowed at the base, usually acute at the apex, not conspicuously veined; ocreæ oblique, silvery, 2-parted or at length lacerate; clusters axillary, 1-5-flowered; calyx green, 5-parted, the lobes with a white or pink border; stamens 5-8; style short, 3-parted to near the base; achene 3-angled, ovoid, 2 mm. long, acute, reticulated.

A weed in waste places. May to September. Avalon Valley, *Bartholomew*; field opposite Chicken Johnny's, *Nuttall* 208; near gate by Catholic Church, *Knopf* 154. KNOTGRASS. DOORWEED.

Order 6. CHENOPODIALES.

Herbs, mostly with perfect flowers. Calyx present. Corolla, if present, polypetalous. Ovary superior. Embryo coiled, curved or annular. Fruit not an achene, rarely achene-like.

Fruit a berry, utricle or achene:

Fruit a utricle:

Bracts not scarious

Bracts scarious

1. CHENOPODIACEAE.

2. AMARANTHACEAE.

- | | |
|--------------------------------|---------------------|
| Fruit not a utricle; | |
| Fruit an anthocarp. | 3. ALLIONIACEAE. |
| Fruit a capsule: | |
| Capsule 2-several celled | 4. AIZOACEAE. |
| Capsule 1-celled: | |
| Sepals 2 | 5. PORTULACACEAE. |
| Sepals 4 or 5: | |
| Sepals united, ovary stipitate | 6. ALSINACEAE. |
| Sepals distinct, ovary sessile | 7. CARYOPHYLLACEAE. |

Family 1. CHENOPODIACEÆ.*

GOOSEFOOT FAMILY

Annual or perennial herbs, rarely shrubs, with angled striate or terete stems. Leaves alternate or sometimes opposite, estipulate, simple, entire, toothed or lobed, mostly petioled (in *Arthrocnemum* reduced to mere scales). Flowers small, green or greenish, regular or slightly irregular, variously clustered, occasionally solitary in the axils. Petals none. Calyx persistent, 2-5-lobed, 2-5-parted or rarely reduced to single sepal, wanting in the pistillate flowers of some genera. Stamens as many as the lobes or divisions of the calyx, or fewer, and opposite them; filaments slender; anthers 2-celled, longitudinally dehiscent. Disk usually none. Ovary 1-celled; ovule solitary, amphitropous; styles 1-3; stigmas capitate, or 2-3-lobed or divided. Fruit a utricle, with a thin or coriaceous pericarp. Seed vertical or horizontal; endosperm mealy, fleshy or wanting.

Endosperm central:

Plants leafy:

 Flowers perfect all of one kind:

 Solitary. Stamens 1

 Clustered. Stamens 5

 Flowers unisexual, of two kinds

 Plants leafless, leaves reduced to scales

Endosperm lateral or wanting

- | |
|------------------|
| 1. APHANISMA. |
| 2. CHENOPODIUM. |
| 3. ATRIPLEX. |
| 4. ARTHROCNEMUM. |
| 5. DONDIA. |

1. APHANISMA Nutt

Slender glabrous annuals, with alternate sessile entire leaves, and axillary mostly solitary perfect bractless flowers. Calyx 3-cleft, with concave segments unchanged in fruit. Stamen 1; filament short. Ovary depressed; style shortly 2-3-cleft; pericarp somewhat 5-angled, rather thick and indurate. Seed horizontal with very thin crustaceous testa. Embryo annular, surrounding the copious endosperm.

1. *A. blitoides* Nutt. Mocq. in DC. Prodr. 13:2:54 (1849)

Stems ascending, branched, 3-7.5 dm. high; leaves thin, oblanceolate to ovate-oblong, the upper ones ovate, acute, 6-15 mm. long; calyx minute; its lobes ovate, obtuse, closely appressed to the base of

*Determinations by Paul C. Standley.

the fruit; fruit 1 mm. broad; seed shining, punctulate-rugose.

In dry situations near the sea. May to August. *Lyon*; on old Indian mounds at Little Harbor, *Trask*.

2. CHENOPODIUM Linn.

Annual or perennial herbs, with alternate petioled leaves. Flowers small, green, perfect, sessile, bractless, clustered. Calyx 2-5-parted or 2-5-lobed, embracing or enclosing the utricle, its segments or lobes often keeled or ridged. Stamens 1-5; filaments filiform or slender. Styles 2 or 3; seed horizontal or vertical, sometimes in both positions in different flowers of the same species; endosperm mealy; embryo completely or incompletely annular.

Annuals. Calyx deeply parted into lobes or segments:

Erect, leaves light green

1. album

Diffuse, leaves dark green

2. murale

Perennials. Calyx merely toothed or cleft.

3. californicum

1. C. album Linn. Sp. Pl. 219 (1753).

Erect annual, 3-20 dm. high, usually much branched, the branches stout or slender, ascending, sometimes from a spreading base, obtusely angled, striate, pale-green, mostly glabrate; petioles slender, one half to one third as long as the blades or rarely equaling them; leaf-blades oval-rhombic, rarely ovate or lanceolate, 2.5-8 cm. long, usually conspicuously longer than broad, obtuse or rounded at the apex, apiculate, often shallowly 3-lobed, irregularly sinuate-dentate, sinuate, or sinuate-serrate, rarely subentire, mostly thick, pale-green and glabrate above, very finely and commonly densely farinose beneath, the upper blades reduced, ovate to lanceolate, usually entire, acute, mucronate, not hastate; flowers in large glomerules, these in dense, stout, erect or ascending, paniculate spikes, the inflorescence usually narrow and compact, rarely lax, grayish-green, sparsely leafy; calyx copiously and finely farinose, deeply lobed, the lobes green, white-margined, acutely carinate, completely enclosing the fruit; pericarp adherent; seed horizontal, 1.3-1.5 mm. broad, nearly smooth, black and shining, the margin obtuse.

Waste grounds. December to July. Vicinity of Avalon, *Trask*; *Brandege*; *Mills* sp. 4711; *Nuttall* 303, 327; *Knopf* 162. LAMB'S QUARTERS, PIG-WEED.

2. C. murale Linn. Sp. Pl. 219 (1753).

Annual, somewhat scurfy above; stem 3-8 dm. high, leafy to the summit. Leaves rhombic-ovate, thin, bright green, acute or acuminate, sharply and coarsely sinuate-dentate, cuneate or subtruncate at the base, slender-petioled, 5-10 cm. long; flowers in loose axillary panicles often not longer than the petioles; calyx-segments not entirely enclosing the utricle; seed sharp-edged, horizontal, firmly attached to the pericarp.

Waste grounds and ditches. February to July. Vicinity of Avalon. *Trask*; *Brandegee*; *Smith* 5071; *Mills* sp. 4477; 4662. GOOSEFOOT.

3. *C. californicum* Wats. Bot. Calif. 2:48 (1880).

Erect or ascending perennial from a thick elongate fleshy root, sparsely farinose on the younger parts, glabrate in age; stems stout, 2-8 dm. high, several from each root, mostly simple; petioles slender, those of the lower leaves equaling or exceeding the blades, the uppermost leaves subsessile; leaf-blades triangular, 5-11 cm. long and nearly as broad, acute or obtuse, hastately lobed at the base, coarsely, deeply, and irregularly laciniate-dentate or sinuate-dentate throughout, bright-green, the upper blades much reduced; flowers in few or many-flowered glomerules arranged in dense, nearly naked, terminal spikes 6-18 cm. long, the lower glomerules often pedunculate and their flowers long-pedicellate; calyx green, herbaceous, cleft to about the middle, the lobes broadly oblong, rounded, truncate, or emarginate, shorter than the fruit; stamens 5; styles elongate; pericarp adherent; seed vertical, compressed-globose, 2 mm, in diameter.

In shade of trees in canyon bottoms. January to May. *Trask*; *Brandegee*; Avalon Valley, *Smith* 4984, *Mills* sp. 4518, 4658, *Nuttall* 588; Pebble Beach Canyon, *Mills* sp. 4696; White's Valley and Swain's Canyon, *Knopf* 90, *Mills* sp. 4597; Equestrian Trail, *Nuttall* 191, 164. SOAP PLANT. The parsnip-like root has been largely used as a detergent in lieu of soap.

3. *ATRIPLEX* Linn.

Herbs or low shrubs, often scurfy-canescient or silvery. Leaves alternate, or some of them opposite. Flowers diœcious or monœcious, small, green, in paniced spikes or capitate-clustered in the axils. Staminate flowers bractless, consisting of a 3-5-parted calyx and an equal number of stamens; filaments separate or united by their bases; a rudimentary ovary sometimes present. Pistillate flowers subtended by 2 bractlets which enlarge in fruit and are more or less united, sometimes quite to their summits; perianth none; stigmas 2. Utricle completely or partially enclosed by the fruiting bractlets. Seed vertical or rarely horizontal; embryo annular; endosperm mealy.

Annuals:

Staminate flowers in naked terminal spikes:
in auxiliary clusters

1. *pacifica*

Staminate flowers in naked terminal spikes:

Plants erect or suffruticose

2. *Coulteri*

Plants decumbent bracts 4 mm. long

3. *Watsoni*

Perennials:

Fruiting bracts not red and fleshy:

Bracts lacinately toothed 2 mm. long

4. *Serenana*

Bracts entire 3-4 mm. long:

Leaves thin, mealy

5. *californica*

Leaves thick, white-scurfy

6. *leucophylla*

Bracts entire, convex

7. *Breweri*

Fruiting bracts red and fleshy

8. *semibaccata*

1. **A. pacifica** A. Nels. Proc. Biol. Soc. Wash. 17:99 (1904).
Atriplex microcarpa D. Dietr. Syn. Pl. 5:536 (1852) not Waldst. & Kit. (1812).

Prostrate annual, much branched, the branches slender, 1-4 dm. long, obtusely angled, furfuraceous when young, glabrate in age, sometimes tinged with red; leaves numerous, alternate, sessile or the lower short-petiolate, the blades oval, oblong, or obovate-oblong, 6-13 mm. long, acute or obtuse at the apex, often mucronulate, cuneate at the base, thin, closely furfuraceous; flowers monœcious, the staminate glomerules mostly in the upper axils, often large, the pistillate flowers in small clusters in the lower axils; calyx deeply 5-cleft; fruiting bracts suborbicular or obovate, 1-1.5 mm. long, sessile, united to above the middle, the apex green, minutely denticulate with 3-5 teeth, the sides smooth or rarely slightly tuberculate; seed 0.8-1 mm. long, the radicle superior.

Dry, open situations. March to July. Trask (as *A. decumbens*); vicinity of Avalon; McClatchie; Pendleton 1422; Reed 2850; summit of Black Jack, alt. 2,000 ft., Nuttall 640.

2. **A. Coulteri** (Moq.) D. Dietr. Syn. Pl. 5:537 (1852).
Obione Coulteri Moq. DC. Prodr. 13.2:113 (1849).

Annual or usually perennial, sometimes suffrutescent at the base, much branched, the branches slender or stout, 0.7-10 dm. long, terete, furfuraceous, often glabrate in age, frequently tinged with red; leaves numerous, alternate, sessile or short-petiolate, the blades obovate, oblong, oblanceolate, or elliptic, 7-15 mm. long, obtuse to acuminate at the apex, cuneate at the base, entire, thin, rather loosely furfuraceous; flowers monœcious, the staminate in rather large glomerules, these in the upper axils or in short naked terminal spikes, the pistillate flowers in small axillary clusters; fruiting bracts sessile, united to the middle, not compressed, 2-3 mm. long, the margins green, deeply and acutely dentate, the terminal tooth longest, the sides nerved, not appendaged; seed 1.5 mm. long, brown, the radicle superior.

Low flats near the sea. November to July. Lyon; Brandegee; sand flat at the Ithmus, Macbride & Payson 870; Trask (hb. U. S.); Nuttall 219; Pacific Slope of the Salta Verde, Knopf 348; Grant & Wheeler 82a/2313. SALTBUSH.

3. **A. Watsoni** A. Nels. Proc. Biol. Soc. Wash. 17:99 (1904).
Atriplex decumbens S. Wats. Proc. Am. Acad. 12:275 (1877) not R. & S. (1820).

Perennial, fruticose only at the base, much branched from the base, the stems 2-10 dm. long, prostrate or decumbent, slender or stout, densely furfuraceous; leaves very numerous, mostly opposite, sessile, the blades broadly ovate to ovate-oblong or oval, 0.8-1.5 cm. long, 3-8 mm. wide, acute or acutish at the apex, obtuse or rounded at the base, entire, subcoriaceous, densely furfuraceous with yellowish-white scales; flowers dicecious, the staminate in large glomerules

arranged in slender or stout, short, interrupted, usually simple, naked, terminal spikes, the pistillate ones in small axillary clusters shorter than the leaves; calyx 5-cleft; fruiting bracts sessile or short-pedicellate, triangular or rhombic, 4-6 mm. long and of the same breadth, compressed, coriaceous, united to above the middle, acute, sparsely denticulate above or rarely entire, not at all herbaceous, not appendaged on the sides; seed 1.5 mm. long, brown.

Salt flats. April to August. At the head of Catalina Harbor, *Grant & Wheeler 82a/2313*; *Pendleton 1426, 1427*; *Mills. 4787*; *Nuttall 221, 811*. SALT-BUSH.

4. **A. Serenana** A. Nels. Proc. Biol. Soc. Wash. 17:99 (1904).
Atriplex bracteosa S. Wats. Proc. Am. Acad. 9:115 (1874)
 not Trautv. (1870).

Erect or decumbent annual, 3-10 dm. high, usually much branched, the branches stout, obtusely angled, furfuraceous when young, glabrate in age; leaves numerous, alternate, sessile or subsessile, the blades oblong, oval, or lance-oblong, 1.5-8.5 cm. long, 0.4-4 cm. wide, obtuse or acute at the apex, mucronate, cuneate at the base, acutely dentate, or the upper blades mostly entire, thin, sparsely farinose, the leaves appearing green or grayish-green; flowers monœcious, the large staminate glomerules in dense or interrupted, narrowly paniculate or rarely simple, naked spikes; calyx deeply 5-cleft; pistillate flowers in few-flowered axillary clusters; fruiting bracts cuneate-orbicular, 2-3 mm. long, united below, the herbaceous margins deeply dentate, the terminal tooth usually longer than the lateral ones, the sides usually conspicuously tuberculate; seed 1-1.5 mm. long, brown, the radicle superior.

Silt of low lands near the coast. June to August. Near the fork of the road at Pebble Beach, *Knopf 161*; *Nuttall 303*.

5. **A. californica** Moq. DC. Prodr. 13.2:98 (1849).

Perennial from a fleshy fusiform root, much branched, the branches slender, prostrate or sometimes ascending, 1.5-5 dm. long, terete, furfuraceous-canescens; leaves numerous, often crowded, alternate, or the lower opposite, the blades elliptic to lanceolate or oblanceolate, 0.6-2 cm. long, 5 mm. wide or less, acute at each end, sessile, entire, furfuraceous-canescens; flowers monœcious, in dense axillary clusters, forming stout, dense, leafy or nearly naked spikes; calyx deeply 4-cleft; fruiting bracts sessile, ovate or broadly ovate, 3 mm. long, free, thin, acute, entire, green; seed 1 mm. long, black, the radicle lateral.

Sands and bluffs of the sea coast. March to June. Vicinity of Avalon, *Trask*; *McClatchie*.

6. **A. leucophylla** (Moq.) D. Dietr. Syn. Pl. 5: 536 (1852).
Obione leucophylla Moq. DC. Prodr. 13.2:109 (1849).

Procumbent or decumbent perennial, fruticose only at the base,

much branched, the stems 3-10 dm. long, terete, stout, densely and coarsely furfuraceous; leaves alternate, numerous, sessile, the blades orbicular to oval or oblong, 1.2-4 cm. long, 0.5-2 cm. wide, rounded or obtuse at the apex, or the uppermost acutish, broadly cuneate or rounded at the base, entire, subcoriaceous, densely yellowish- or brownish-furfuraceous; flowers monoecious, the staminate glomerules in dense, stout, terminal, mostly simple spikes, the pistillate in few-flowered axillary clusters; calyx 5-cleft; fruiting bracts sessile, spongy, not compressed, rounded-ovate, acutish, united to above the middle, entire or dentate, usually with numerous short, stout, often flattened appendages on the sides, densely and coarsely furfuraceous; seed 2-3 mm. long, the radicle superior.

Sandy beaches. July to October. Head of Catalina Harbor, *Trask*; *Reed* 2855; *Nuttall* 217; in dense mats just above high tide at Little Harbor, *Knopf* 189. SALT GRASS.

7. **A. Breweri** S. Wats. Proc. Am. Acad. 9: 118 (1874).

Erect shrub, 15-25 dm. high, much branched, the branches slender, terete or obtusely angled, unarmed, ascending or spreading, densely furfuraceous when young, becoming glabrate and pale-brown; leaf-blades deltoid-ovate or rhombic, 1.5-5 cm. long, obtuse or rounded at the apex, mucronulate, cuneate at the base or subtruncate or rounded and abruptly decurrent to the short stout petiole, rather thin, closely furfuraceous on both surfaces, pinnately veined, the lateral veins few, divergent or ascending; flowers dioecious, the staminate ones in dense glomerules 2-3 mm. in diameter, these in dense or interrupted, slender, paniculate spikes, the inflorescence leafy or nearly naked; pistillate flowers arranged in slender dense spikes, these forming a broad, nearly naked, much branched panicle, the branches slender, often drooping; calyx deeply 4- or 5-cleft, furfuraceous; fruiting bracts orbicular or ovate-orbicular, entire, 2-3 mm. long, strongly convex, slightly scurfy, pale-yellowish; seed 1.2-1.5 mm. long, compressed, reddish-brown, the radicle ascending.

Near the sea. January to May. *Trask*; a large spreading clump 6 feet high near the beach line at White's Landing, *Mills* sp. 4586.

8. **A. semibaccata** R. Br. Prodr. 406 (1810).

Prostrate perennial, suffrutescent at the base, much branched, the branches slender, terete, 3-10 dm. long, whitish, sparsely furfuraceous or glabrate; leaves numerous, alternate, short-petiolate, the blades oblong or obovate-oblong, 1-3.5 cm. long, 2-9 mm. wide, obtuse or acute, cuneate to attenuate at the base, irregularly and remotely repand-dentate, or the upper entire, thin, densely and finely white-furfuraceous beneath, usually glabrate and green on the upper surface; flowers monoecious, solitary or in small clusters in the axils, the staminate clusters usually in terminal glomerules; fruiting bracts sessile, rhombic, 4-5 mm. long, united at the base, compressed, the margins denticulate or entire, the sides nerved, not appendaged, the

bracts becoming red and somewhat fleshy at maturity; seeds 2 mm. long, dark-brown, the radicle lateral.

Dry, open grounds generally. Flowers and fruits the year around. An Australian plant greatly relished by sheep. It grows in dense mats and spreads rapidly. Hillsides near Avalon, *Millsp.* 4504, *Knopf* 256; Pebble Beach, *Nuttall*, 193; Pacific Slope of the Salta Verde, *Knopf* 348; Isthmus, *Nuttall* 219. AUSTRALIAN SALT BUSH. DOUGLASS.

4. **ARTHROCNEMUM** Moq.

Erect or decumbent, glabrous, fleshy shrubs with opposite articulate branches, the joints dilated at the apex into a short sheath. Flowers perfect, free or nearly so, immersed in groups of 3 on the opposite sides of the joints, the flowering joints forming cylindric terminal spikes, or sometimes only the lower joints of the stems floriferous. Perianth obpyramidal or oval, spongy or slightly inflated in fruit, 3- or 4-dentate at the apex, the lateral teeth larger than the others. Stamens 2. Ovary oval, somewhat compressed; style elongate; stigmas 2, slender. Uricle oval, thin or indurate, included in the perianth. Seed erect, oblong, compressed, glabrous; embryo curved, surrounding the copious endosperm; radicle inferior.

1. **A. subterminale** (Parish) Standl. Jour. Wash. Acad. Sci. 4:399 (1914).

Salicornia ambigua S. Wats. Proc. Am. Acad. 9:125, pt. (1874) not Michx. (1803).

Salicornia subterminalis Parish, Eryth. 6:87 (1898).

Shrub, 2-4 dm. high, densely branched, the branches green, ascending or erect, or the basal ones often decumbent, the joints 0.2-2.6 cm. long, 1.5-2.5 cm. in diameter, expanded at the apex into a short, truncate or bilobate sheath, the lobes obtuse or acutish; flowering joints borne on the lower part of the branches or forming terminal spikes, the spikes 3.5 cm. long or shorter, composed of few or numerous joints, these about as broad as long; flowers subequal, borne near the base of the joint and reaching half way to the apex; seed brown, 1 mm. long.

Saline mud flats. January to August. In the mud flat at the head of Catalina Harbor, *Trask*; *Brandege*; *Millsp.* 4610, 4611; *Nuttall* 223, 802; Little Harbor. *Nuttall* 1160. SAMPHIRE. GLASSWORT.

5. **DONDIA** Adans.

Fleshy herbs or low shrubs, with alternate narrowly linear, thick or nearly terete, entire sessile leaves, and perfect or polygamous bracteolate flowers, solitary or clustered in the upper axils. Calyx 5-parted or 5-cleft, the segments in fruit enclosing the utricle. Stamens 5.

Styles usually 2, short. Pericarp separating from the seed. Embryo coiled into a flat spiral. Endosperm wanting or very little.

Stems and leaves glabrous or nearly so.
Stems and leaves densely tomentose

1. *californica*
2. *taxifolia*.

1. **D. californica** (Wats.) Heller, Cat. N. A. Pl. 3 (1898).

Suaeda californica S. Wats. Proc. Am. Acad. 9:89 (1874).

Glaucous, glabrous or sparsely villous, ascending or decumbent, branched perennial, 2-8 dm. high, the branches very stout, frutescent below, densely leafy, or the leaves deciduous below; leaves subterete 1.5-3.5 cm. long, ascending or suberect, acute or acuminate, those of the inflorescence little reduced; flowers 1 or 2 in each axil; calyx deeply cleft, glaucous, the lobes obtuse or acutish, rounded on the back; seed vertical or horizontal, 1.5-2 mm. broad, black, shining.

Salt marshes. March to August. Mud flat at the head of Catalina Harbor and base of Ballast Point, *Trask*; *Reed* 2858; *Millsp.* 4923.

2. **D. taxifolia** Standley, N. A. Flora 21:91 (1916).

Suaeda Torreyana S. Wats. Bot. Calif. 2:59 pt. (1880).

Dondia californica Abrams, Fl. Los. Ang. 131 pt. (1904).

Green, much branched perennial, 2-12 dm. high, copiously tomentulose or short-villous throughout; branches very stout, 3-7 mm. in diameter, paniculately branched, the ultimate branches ascending; leaves terete, 12-25 mm. long, acute or acuminate, ascending or spreading, crowded, those of the inflorescence little reduced; flowers globose, 2.5-3 mm. broad, 1-4 in each axil; bractlets acuminate or attenuate; calyx densely pubescent, cleft to the middle or lower, the lobes obtuse or acute, rounded on the back; seeds usually vertical, 1.5-2 mm. long, black.

Saline mudflats. May to August. Shores of Catalina Harbor, *Pendleton* 1423; *Macbride & Payson* 865; *Nuttall* 805, 225.

Family 2. **AMARANTHACEÆ.**

FIGWEED FAMILY.

Herbs, or a few genera low shrubs, with simple, mostly entire, thin leaves. Flowers small, green or white, bracteolate, variously clustered, usually in terminal spikes or axillary heads. Petals none. Calyx herbaceous or membranous, 2-5 parted, the segments distinct, or united at the base, equal, or the inner ones smaller. Stamens 1-5, mostly opposite the calyx-segments, hypogynous; filaments distinct, united at the base, or into a tube. Ovary 1-celled; ovule solitary in the majority of genera, amphitropous, several in some tropical genera; stigmas 1-3. Fruit a utricle, circumscissile, bursting irregularly, or indehiscent, 1-seeded or several-seeded. Seeds mostly smooth; embryo annular; endosperm mealy, usually copious.

1. **AMARANTHUS** Linn.

Annual branched erect or diffusely spreading glabrous or pubescent herbs, with petioled pinnately veined leaves and small monœcious polygamous or dioecious, green or purplish, mostly 3-bracteolate flowers in dense terminal spikes or axillary clusters. Calyx of 1-5 distinct sepals. Stamens 1-5; anthers longitudinally dehiscent. Styles or stigmas 2 or 3. Fruit an ovoid or oblong utricle, 1-seeded, 2-3-beaked by the styles. Embryo annular.

1. **A. græcizans** Linn. Sp. Pl. 990 (1753).

Amaranthus albus Linn. Sp. Pl. ed. 2, 1404 (1763).

Stems freely and rigidly branching, 3.3-9.1 or 12.2 dm. high, commonly of bushy outline; herbage light or somewhat yellowish-green glabrous or nearly so; leaves oblong-spatulate or obvate, 8.4-16.8 mm. long; flowers in clusters in short, axillary spikes; bracts subulate, 2.1-3.1 mm. long, much longer than the sepals; sepals 3, oblong, acute or obtuse, thin, shorter than the rugose utricle.

A weed of waste places and cultivated ground. May to September. So far only known on the island through the report of McClatchie in *Erythea* 2:79. **TUMBLEWEED.**

Family 3. **ALLIONIACEÆ.**

(*Nyctaginaceae*)

FOUR O'CLOCK FAMILY.

Herbs, some tropical genera trees or shrubs, with simple entire leaves, and regular flowers in clusters, in many of the genera subtended by involucre. Petals none. Calyx inferior, usually corolla-like, its limb 4-5-lobed or 4-5-toothed. Stamens hypogynous; filaments filiform; anthers 2-celled, dehiscent by lateral slits. Ovary enclosed by the tube of the perianth, 1-celled, 1-ovuled; ovule campylotropous; stigma capitate. Fruit a ribbed grooved or winged anthocarp.

Fruit winged
Fruit not winged

1. **ABRONIA.**
2. **HESPERONIA.**

1. **ABRONIA** Juss.

Ours perennial herbs, often prostrate and more or less viscid-pubescent, with thick opposite unequal leaves. Involucre of 5-15 somewhat scarious leaflets, enclosing numerous sessile, showy and fragrant flowers. Calyx salver-shaped, the lobes usually 5, obcordate or emarginate. Stamens usually 5, unequal, adnate to the calyx-tube and included. Style included; stigma linear-clavate. Fruit indurated, 3-5-winged; achene smooth, cylindric. Embryo with only 1 cotyledon.

1. **A. maritima** Nutt. Watson, Bot. Calif. 2:4 (1880).

Stems stout, the lower portion usually buried in drifting sand, prostrate, succulent and viscid; leaves thick, broadly ovate to oblong, cuneate or rounded at base, 3-5 cm. long, vertical on stout petioles of about the same length; peduncles slightly exceeding the leaves; involucre bracts short, ovate-oblong, enclosing 10-15 flowers, forming a narrow head; calyx 1 cm. long, deep red; fruit viscid-pubescent; wings rather thick.

On the sea strand beaches. April to June. *Trask*; *Brandegge*; *McClatchie*; beach at mouth of Gallagher's Canyon, *Eastwood* 6466; dunes of the north-west beach at Little Harbor, *Nuttall* 813; White's Landing, *Knopf* 389. SAND VERBENA.

2. **HESPERONIA** Standl.

Perennial herbs; leaves opposite, thick, entire, petioled or sessile; inflorescence axillary or terminal; involucre campanulate, composed of 5 bracts which are united by their bases for about half their length, not enlarged in fruit; flowers 1 in each involucre; perianth campanulate, white or purplish red; stamens usually 5, distinct; fruit ellipsoidal or spherical, not angled or ribbed, smooth or sometimes very faintly tuberculate, glabrous.

1. **H. californica** Standl. Contr. U. S. Nat. Herb. 12:364 (1909).
Mirabilis californica Gray. Bot. Mex. Bound. 173 (1859).

Stems ascending or spreading from a somewhat woody base, 3-6 dm. long; herbage viscid-pubescent; leaves rather thick, 1-3 cm. long, broadly ovate to cordate, obtuse to acute; petioles slender, 1-2 cm. long; involucre about 6 mm. long, acutely 5-cleft to near the middle; calyx narrowly campanulate, 10 mm. long, the lobes spreading, emarginate; stamens equaling the calyx and nearly equaling the style; fruit ovate, smooth, 3 mm. long.

Dry hillsides everywhere. Blooms the year around. *Lyon*; *Trask*; *Brandegge*; Pebble Beach, *Parish* 10763; Avalon vicinity, *Eastwood* 6443, *Pendleton* 1367, *Nuttall* 21, *Smith* 4986; Descanso Canyon, *Mills* 4197; Big Wash Canyon, *Nuttall* 686; Pebble Beach Canyon, *Knopf* 3, 59. FOUR-O'CLOCK, WISHBONE-BUSH.

Family 4. **AIZOACEÆ.**

CARPET-WEED FAMILY

Ours prostrate or decumbent herbs. Flowers perfect and regular either solitary or clustered. Calyx 4 or 5-lobed or -parted, either free from or more or less adnate to the ovary. Stamens hypogynous or commonly perigynous, fewer than the sepals or more numerous. Fruit a loculicidal or circumscissile capsule or indehiscent.

I. MESEMBRYANTHEMUM L.

Ours very fleshy maritime herbs, with opposite estipulate leaves. Flowers large and showy, terminal and in the forks of the branches. Calyx-tube adnate to the ovary, the lobes 5, unequal, herbaceous. Petals numerous, linear. Stamens very numerous, with slender filaments, inserted with the petals on the tube of the calyx. Capsule 4-20-celled, with as many styles, dehiscing at the depressed summit by stellate valves. Seeds many, minute.

Leaves smooth, opposite.

Leaves scaly-vescicular, alternate:

Leaves flat, ovate to spatulate

Leaves semiterete, linear

1. *æquilaterale*.

2. *crystallinum*

3. *nodiflorum*

1. *M. æquilaterale* Haw. Misc. Nat. 77 (1803).

Perennial, with stout prostrate or ascending stems and short ascending flowering branches; leaves very fleshy, opposite and clasping, linear, actually triangular, 5 to 15 cm. long, smooth; flowers solitary, red, pedicellate or nearly sessile, about 7.5 cm. in diameter; calyx-tube turbinate, 12.7 mm. long or more, angled or terete; the larger lobes often as long; stigmas 6 to 10.

Near the sea shore. March to June. At various points along the eastern coast line. Observed but not collected by us. BEACH STRAWBERRY.

The fruits are edible and pleasant.

2. *M. crystallinum* Linn. Sp. Pl. 480 (1753).

Annual or biennial, diffusely procumbent, covered with large white glistening papillae; leaves flat, fleshy, often alternate on the branches, clasping, ovate or spatulate, undulate; flowers axillary, nearly sessile, white or rose-colored; calyx-tube campanulate, terete, 5.5-7 mm. long; lobes ovate, retuse or acute; stigmas 5.

Dry or sandy places near the coast. May to August. *Lyon, Brandege* (lists); *Eastwood 6450*; fields near Catalina Harbor, *Mills 4622, Nuttall 220, 812*. ICE PLANT.

3. *M. nodiflorum* Linn. loc. cit.

Stems several from the base, prostrate or ascending; herbage covered with fine vesicles; leaves linear, 1.5-2.7 cm. long, 2-4 mm. wide; flowers solitary in the axils, subsessile or shortly peduncled; petals white, minute, much shorter than the calyx-lobes.

Dry fields and sands near the coast. May to September. *Brandegee, Hasse; Blake 966; Macbride & Payson 869*; at the Isthmus near Catalina Harbor, *Mills 4623, Nuttall 226*; Pacific Slope of the Salta Verde, *Knopf 388*; Pebble Beach, *Nuttall 194*. FIG MARIGOLD.

Family 5. **PORTULACACEÆ.**

PURSLANE FAMILY.

More or less succulent herbs, with simple and entire leaves (either opposite or alternate), and regular but unsymmetrical perfect flowers; the sepals only 2, while the petals are from 2 to 5 or more; the stamens opposite the petals when of the same number or fewer; the ovary 1-celled with few or many campylotropous or amphitropous ovules on a free central placenta, in fruit becoming capsular; the seeds with a slender embryo curved or coiled on the outside of farinaceous albumen, as in Caryophyllaceæ. — Ovary free and the parts of the flower hypogynous, except in *Portulaca*. Stamens sometimes indefinitely numerous, commonly adhering to the base of the petals; these sometimes united at base. Style 2-8-cleft; the stigmas occupying the inner face of the lobes. Stipules none, or scarious, or reduced to hairs. Flowers open only in sunshine or bright daylight, in many ephemeral, in some opening for two or three days.

Stamens more than 5, seeds many
Stamens usually 3, seeds few

1. *CALANDRINIA*.
2. *MONTIA*.

1. **CALANDRINIA** HBK.

Sepals 2, green, persistent. Petals mostly 5 (3 to 10). Stamens 5 to 15, indefinite. Ovary free, many-ovuled: style 3-cleft, short. Capsule globose or ovoid, membranaceous, 3-valved. Seeds black, usually shining, smooth or minutely tuberculate.—Low succulent herbs; with alternate or radical leaves, and purplish ephemeral flowers in bracteate racemes or panicles, or few upon short scape-like stems.

Leaves cauline, seeds shining
Leaves rosulate, seeds dull

1. *Menziesii*
2. *maritima*

1. **C. Menziesii** (Hook.) T. & G. Fl. 1: 197 (1838).

Talinum Menziesii Hook. Fl. Bor. Am. 1: 223 (1833).

Calandrinia caulescens Menziesii Gray. Proc. Am. Acad. 22: 227 (1887).

Glabrous or slightly pubescent, branching from the base, the stems ascending; leaves linear to oblanceolate, the lower on slender petioles, 5 to 15 cm. long; racemes simple; peduncles erect or ascending; sepals keeled, the calyx 4-angled in bud: petals broadly obovate, red to purple, 4.2-12.7 mm. long: capsule ovate, acute or acuminate, 7 to 12 mm. long, about equalling or a little exceeding the ovate acute or acuminate sepals: seeds shining, minutely tuberculate, 2 to 3.5 mm. broad.

Moist, sunny slopes. March to May. *Trask* (N. Y., Field); *Brandegee* list; on newly turned soil part way up Equestrian Trail, *Nuttall* 255. KISSES.

2. **C. maritima** Nutt T. & Gr. *Fl. ibid.*

Glaucous: stems spreading, 7.6 to 12.7 cm. high, with small bract-like leaves above the base: lower leaves obovate or obovate-spatulate, 2.6 cm. long, fleshy, obtuse: flowers in a loose dichotomous terminal panicle, on slender pedicels, "red, rather large and showy": sepals ovate, acute: capsule oblong-ovate, 4.2 mm. long, exceeding the sepals, acutish.

On "break off" near the sea. March. *Trask* (N. Y., Field). SEA KISSES.

2. **MONTIA** L.

Low glabrous and succulent herbs with delicate pale rose-colored or white flowers in loose axillary or terminal, simple or compound racemes. Sepals 2, rarely 3, persistent. Petals usually 5, rarely 3 or wanting, more or less united at base, usually slightly unequal. Stamens 3-5, inserted on the corolla opposite the lobes. Ovary 3-ovuled. Capsule 3-valved, 3-seeded.

1. **M. perfoliata** (Donn.) Howell, *Eryth.* 1:38 (1893).

Claytonia perfoliata Donn. *Ind. Hort. Cantab.* 25 (1796).

Stems 5-30.5 cm. high: radical leaves long-petioled, broadly rhomboidal, or deltoid, or deltoid-cordate, 1.4-7.5 cm. broad, obtuse; the cauline pair more or less united upon one or both sides, usually forming a single somewhat orbicular perfoliate leaf, 1.4-5 cm. in diameter, concave above: racemes simple or compound, usually nearly sessile and loosely flowered, the short pedicels often secund: petals 2.1 or 4.2 mm. long; capsule about 3-seeded.

Moist, shady places, common. January to May. *Trask*; *Brandege* list: Road to Summit in the ditches, *Smith* 5022, *Mills* 4530; Rock Spring Canyon, *Mills* 4733; Avalon Canyon, *Nuttall* 57, 1077. MINER'S LETTUCE.

Family 6. **ALSINACEÆ.**

CHICKWEED FAMILY

Annual or perennial herbs, sometimes shrubby at the base, with a watery sap. Stems often diffusely branched. Leaves opposite, with or without stipules: blades various, entire. Flowers mostly perfect, sometimes incomplete. Perianth usually of 2 series. Calyx of 4-5 persistent distinct or nearly distinct sepals. Corolla of 4-5 clawless petals, or wanting. Androecium of twice as many stamens as there are sepals or fewer. Filaments distinct or cohering below. Anthers introrse, opening lengthwise. Gynoecium of 2-5 united carpels. Ovary 1-celled or rarely 2-5-celled. Styles 2-5. Ovules several or many, amphitropous or campylotropous, on a central column. Fruit

a capsule, opening by valves, these sometimes tooth-like. Embryo more or less curved in the endosperm, usually with incumbent cotyledons.

Styles 3-5, distinct:

Stipules none.

Petals bifid

Petals entire.

Styles as many as sepals

Styles fewer than sepals

Stipules present

Styles single 3-cleft or -toothed

1. ALSINE.

2. SAGINA.

3. ARENARIA.

4. TISSA.

5. POLYCARPON.

1. ALSINE L.

Tufted herbs, with cymose white flowers. Sepals 5, rarely 4. Petals of the same number, 2-cleft, 2-parted, or emarginate, white in our species, rarely none. Stamens 10 or fewer, hypogynous. Ovary 1-celled; styles commonly 3, rarely 4 or 5, usually opposite the sepals. Capsule deliscent by twice as many valves as there are styles.

Annual, capsule ovoid.

Biennial or perennial, capsule oblong.

1. media.

2. nitens.

1. **A. media** L. Sp. Pl. 272 (1753).

Stellaria media Vill. Hist. Pl. Dan. 3:615 (1789).

Annual, tufted, much branched, decumbent or ascending, 1-4 dm. long, glabrous except a line of hairs along the stem and branches, the pubescent sepals and the sometimes ciliate petioles. Leaves ovate or oval, 4-35 mm. long, acute or rarely obtuse, the lower often cordate; flowers 4-8 mm. broad in terminal leafy cymes or also solitary in the axils; sepals oblong, longer than the 2-parted petals; stamens 2-10; capsule ovoid, longer than the calyx; seeds rough.

Shady situations in the smaller washes. January to June. *Brandegge* and *Lyon* lists; Coach Road and Cherry Canyon, *Smith* 5024, 5087; Hamilton and Pebble Beach Canyons, *Mills* 4532, 4690; Equestrian Trail, Avalon Valley and Coach Road, *Nuttall* 243, 1080, 1165. CHICKWEED.

2. **A. nitens** (Nutt.) Greene, Man. Bay Reg. 33 (1894).

Stellaria nitens Nutt. T. & Gr. Fl. N. A. 1:185, 675 (1838).

Stems erect, filiform, branching above, 7.6-17.9 (or 25.5) cm. high, glabrous or slightly hairy below; leaves linear, acute, sessile, 4.2-14.8 mm. long, or the very lowest ovate, 2.1-6.3 mm. long, abruptly contracted into slender petioles nearly twice as long; inflorescence strict, the pedicels erect, 19 mm. long or less, or some of the flowers quite sessile; bracts scarious; sepals scarious-margined, subulate-lanceolate, 4.2 mm. long; petals one-half as long as the sepals, sometimes none; capsule oblong, nearly as long as the calyx.

Grassy hillsides. March to June. Slopes of canyons. *McClatchie* (In hb. N. Y. Bot. Gard.; part sp. in Field).

2. **SAGINA** L.

Tufted matted low herbs, with subulate leaves, and small pedicelled whitish flowers. Sepals 4 or 5. Petals of the same number, entire, emarginate or none. Stamens of the same number, or fewer, or twice as many. Ovary 1-celled, many-ovuled. Styles as many as the sepals and alternate with them. Capsule 4-5-valved, at length dehiscent to the base, the valves opposite the sepals.

1. **S. occidentalis** Wats. Proc. Am. Acad. 10:345 (1875).

Annual, glabrous, very slender and delicate, 5-16 cm. high, decumbent at base or ascending: leaves not fascicled, 5-7 mm. long, pungent: flowers pentamerous, on elongated straight pedicels: sepals obtuse or acutish, 2.1 mm. long: petals nearly equalling the sepals: stamens 10: capsule exceeding the calyx.

Salt marshes. Recorded in *Lyon* and in *Brandegee* lists. No other knowledge of the (doubtful) occurrence on Catalina can be gained. There is no Catalina specimen in herb. Univ. of California. PEARLWORT.

3. **ARENARIA** L.

Mainly tufted herbs, with sessile leaves, and terminal cymose or capitate, rarely solitary, white flowers. Sepals 5. Petals 5, entire or scarcely emarginate, rarely none. Stamens 10. Styles generally 3 (rarely 2-5). Ovary 1-celled, many-ovuled. Capsule dehiscent at the apex by as many valves or teeth as there are styles, or twice as many. Seeds reniform-globose or compressed.

1. **A. Douglasii** Fenzl. T. & Gr. Fl. N. A. 1: 674 (1840).

Sparingly pubescent with spreading hairs or glabrous, slender, much branched, 7.6-15.2 cm. high: leaves filiform, 6 mm.-2.5 cm. long: flowers rather large, on long slender pedicels: sepals oblong-ovate, acute, 3-nerved, 2.5 mm. long: petals obovate, 3 mm. long or more: capsule globose, equalling the calyx: seeds large, flat, smooth, acutely margined.

Open places. March to May. *Brandegee* list; newly turned soil along Equestrian Trail, *Nuttall* 266. SANDWORT.

4. **TISSA** Adans.

Low herbs, mostly with fleshy linear or setaceous leaves, often with others clustered in the axils, and small pink or whitish flowers in terminal cymes. Stipules scarious. Sepals 5. Petals the same number, rarely fewer, or none, entire. Stamens 2-10. Ovary 1-celled, many-ovuled; styles 3. Pod 3-valved to the base. Seeds reniform-globose or compressed, smooth, winged or tuberculate.

Perennial:

Erect, root thick, fleshy.

Prostrate, matted.

1. *macrotheca*.

2. *Clevelandi*.

Annual:

Erect or prostrate, glandular.

3. *salina*.

1. **T. *macrotheca*** (Hornem.) Britton. Bull. Torr. 16:129 (1889).
Arenaria macrotheca Hornem. C. & S. Linn. 1:53 (1826).
Lepiogonum macrothecum F. & Mey. Cat. Sem. Hort. Petrop.
 3:14 (1835).
Spergularia macrotheca Hey. Rob. in Gray Syn. Fl. 1:252
 (1897).

Perennial, rather stout, often 60 cm. high, decumbent at base, glabrous below, pubescent above, the calyx more or less tomentose: leaves fleshy, 2.5-10 cm. long, with large ovate stipules: flowers large, subracemose; pedicels 1.3-3.8 cm. long, becoming reflexed: sepals 9 mm. long or more, equalling or exceeding the petals: capsule ovoid, a little exceeding the calyx, seeds smooth, narrowly winged.

Rocky talus near the sea. April to August. Lyon list (as *Lepigonum ulacrothecum*); Brandegee (Gray, Field); Pendleton 1362; Reed 2814; talus east of Avalon, Nuttall 290. SAND SPURREY.

2. **T. *Clevelandi*** Greene, Fl. Fr. 127 (1891).
Spergularia Clevelandi Proc. Am. Acad. 29:310 (1894)

Prostrate, slender, very diffuse, forming deep green mats 30-60 cm. broad; herbage slightly pubescent and moderately viscid; leaves narrowly linear, the fascicled ones subulate, all equalling or exceeding the internodes: flowers in terminal cymes only, small (1.7 cm. broad), pure white.

Waste grounds away from the immediate sea influence. February to June. Avalon Valley, Smith 5072; Beckwith 5; Millsp. 4724; Nuttall 166.

3. **T. *salina*** (Presl.) Britton, Bull. Torr. 16:126 (1889).
Spergularia salina Presl. Fl. Cech. 93 (1819).
Arenaria rubra marina Linn. Sp. Pl. 606 (1753).

Stout, erect or ascending, smooth or glandular-pubescent; capsule 5-8 mm. long at maturity; pedicels short (seldom more than twice this length); seeds smooth, margined or marginless, or roughened with projecting points or processes, several kinds sometimes found within the same capsule; leaves often much clustered in the axils.

Brackish mud flats. April to June. Brandegee list; vicinity of Avalon. Smith 5002; dried mud of head of Catalina Harbor, Millsp. 4833; Nuttall 214, 578. SEA SPURREY.

5. POLYCARPON L.

Sepals entire, scarious upon the margin. Petals small, hyaline. Stamens 3-5. Ovary 1-celled: style short, 3-cleft. Capsule 3-valved.

several-seeded. Low diffuse dichotomously branched annuals; leaves flat; stipules small, scarious; flowers small, cymose.

1. **P. depressum** Nutt. T. & Gr. Fl. N. A. 1:174 (1838).

Very small and much branched, scarcely 2.6 cm. high, slender and glabrous; leaves narrowly spatulate, in pairs; stipules small and narrow; flowers minute, in loose cymes, the pedicels with small bracts; petals narrow, much shorter than the sepals, entire; capsule globose, 6-12-seeded.

Sandy soil of lower altitudes. March to June. *Brandegee* list; *Grant* 1023; "break-off" east of Avalon, *Pendleton* 1407; *Reed* 2841.

Family 7. CARYOPHYLLACEÆ.

PINK FAMILY

Annual or perennial herbs, with watery sap and usually erect stems swollen at the nodes. Leaves opposite, often with connate bases; stipules none. Flowers perfect, polygamous or rarely dioecious. Calyx of 4 or 5 united sepals forming a toothed tube. Corolla often showy, of 4 or 5 petals with narrow claws. Stamens usually twice as many as the petals; filaments usually distinct, inserted like the corolla and 1-celled ovary on the columnar prolongation of the receptacle. Pistil 1, compound. Styles 2-5. Ovules numerous. Fruit a capsule opening by 2-5 apical valves. Seeds many or rarely few, with the embryo straight or nearly so.

1. SILENE L.

Herbs, with mainly pink, red or white flowers. Calyx more or less inflated, 5-toothed or 5-cleft, 10-many-nerved, not bracted at the base. Petals 5, narrow, clawed. Stamens 10. Styles 3 (rarely 4 or 5); ovary 1-celled, or incompletely 2-4-celled. Pod dehiscent by 6 or rarely 3 apical teeth. Seeds mainly spiny or tubercled.

Calyx about 20 nerved.

1. *multinervia*.

Calyx about 10 nerved.:

Internodes not glandular, flowers racemose.

2. *anglica*.

Internodes banded-glandular, flowers paniculate.

3. *antirrhina*.

1. **S. multinervia** Wats. Proc. Am. Acad. 25:126 (1890).

Annual, erect, sparingly branched, glandular-pubescent, about a foot high; leaves linear to linear-oblong, acute, the lowermost narrowly oblanceolate, 2.6-5.1 cm. long; inflorescence dichotomously cymose; bracts linear; calyx narrowly ovate, 20-25-nerved, 10.5-12.7 mm. long,

the acuminate teeth usually purple-tipped; petals purplish, scarcely equalling the calyx, without appendages or auricles, emarginate: filaments glabrous, included: capsule nearly sessile, oblong-ovate, included: seeds minute, tuberculate, not crested.

Hillsides in dry situations. March to May. This species is doubtless in the flora, but has not been found by us. *Brandeggee* lists it as such and also as *S. conoidea*, *S. quinquevulnera*? and *S. quadrivulnera*. CATCHFLY.

2. ***S. anglica*** Linn. Sp. Pl. 416 (1753).

Silene gallica Linn. *ibid.* 417.

Annual, hirsute-pubescent; stem 3.3-6.8 dm. high. Leaves spatulate or oblanceolate, 2.6-5.1 cm. long, obtuse, sometime mucronate, or the upper narrower and acute; flowers in a terminal simple 1-sided raceme, nearly sessile or the lower ones distant and longer-pedicelled, sometimes all distinctly pedicelled; calyx 10-nerved, villous, 8.4-10.5 mm. long, much enlarged by the ripening pod, its teeth lanceolate, spreading; petals white, somewhat longer than the calyx.

Established on rough hill and canyon sides. February to June. *Brandeggee* list; Pebble Beach Canyon, *Mills* p. 4688; vicinity of Avalon on School House Ridge, along the Coach Road and Equestrian Trail, *Nuttall* 40, 158, 286. ENGLISH CATCHFLY.

3. ***S. antirrhina*** Linn. Sp. Pl. 419 (1753).

Annual, puberulent or glabrous, glutinous about the nodes, 2-7 dm. high. Basal and lower leaves spatulate or oblanceolate, 2-5 cm. long, narrowed into a petiole; upper leaves linear to subulate; inflorescence a loose cymose panicle; pedicels slender, erect; flowers pink, 2-4 mm. broad; calyx narrowly ovoid, 4-6 mm. long, much expanded by the ripening pod, its teeth ovate, acute; petals obcordate, minutely crowned.

Hillsides. April to July. *Brandeggee* list. We have seen no Catalina specimen of this species, though the report of its presence in the flora is doubtless correct. SLEEPY CATCHFLY.

Order 7. RANALES.

Herbs, shrubs or trees. Calyx present, usually of separate sepals. Corolla usually present and of separate petals. Ovary or ovaries superior, free from the calyx; carpels 1 to many, usually separate. Stamens mostly hypogynous and more numerous than the sepals.

Family 1. RANUNCULACEÆ.

BUTTERCUP FAMILY

Herbs, or rarely climbing shrubs, with acrid sap. Leaves alternate (except in *Clematis* and *Atragene*). Stipules usually none, but the base of the petiole often sheathing. Pubescence, when present, composed of simple hairs. Sepals 3-15, generally caducous, often petal-like,

imbricate, except in *Clematis* and *Atragene*. Petals about the same number (occasionally more) or wanting. Stamens ∞ , hypogynous, their anthers innate. Carpels ∞ or rarely solitary, 1-celled, 1-many-ovuled. Ovules anatropous. Fruit achenes follicles or berries. Seeds with endosperm.

Carpels several-ovuled; fruit a follicle.

1. DELPHINIUM.

Carpels 1-ovuled, fruit an achene:

Achenes long tailed, petals none, climbers.

2. CLEMATIS.

Achenes not tailed, petals present, low herbs.

3. RANUNCULUS.

1. DELPHINIUM Linn.

Erect branching herbs, with racemose or paniculate showy flowers. Leaves palmately lobed or divided. Sepals 5, the posterior one prolonged into a spur. Petals 2 or 4, small, the two posterior ones spurred, the lateral, when present, small. Carpels few, sessile many-ovuled, forming follicles at maturity.

Flowers many, dark purplish-blue.

1. Parryi.

Flowers few, pink or white.

2. hesperium.

1. *D. Parryi* Gray? Bot. Gaz. 12:53 (1887).

Stems commonly simple, 3.3-8 dm. high, arising from a short caudex crowning several woody-fibrous roots; herbage minutely puberulent; leaves twice divided and redivided into narrowly linear lobes, the lobes usually elongated, acute, 12.7 mm.-6.3 cm. long, and often arcuate-contorted; upper leaves often pedately 5-divided into filiform lobes; racemes virgate, often cylindric, sometimes loose, strict, 10.1-35.8 cm. long; pedicels mostly 8.4-25 mm. long or the lower longer; flowers blue or light purplish, rarely white-flowered; sepals 12.7-16.9 mm. long, equaling the spur, one and a half to two times as long as the petals; follicles puberulent, 10.5-12.7 mm. long; seeds with loosely cellular whitish margin to the angles.

Moister grassy slopes and canyon bottoms. May to June. *Trask* (as *D. scopulorum*); *Brandegee*; ridge between Rock Spring and Rock Falls Canyons, *Smith* 5106; Pebble Beach Road, *Nuttall* 208; *Knopf* 79, 103; Pebble Beach Canyon, *Nuttall* 276, *Knopf* 141; Schoolhouse Ridge, *Nuttall* 34; Middle Ranch Canyon, *Nuttall* 300. LARKSPUR.

The status of these plants, and those referred to the next species, is provisional only. The Pacific Slope Delphiniums await the consideration of a discriminating monographist who can work over the material of all herbaria.

2. *D. hesperium* Gray? *idem*.

Stem commonly simple, 1.6-9.1 dm. high, arising from a cluster of thick-fibrous roots or a single woody taproot; herbage shortly pubescent; leaves 2 to 3 times palmately cleft into oblong or linear spreading segments; raceme rather dense, virgate, 15-33 cm. long; pedicels 4.2-12 mm. long, or the lowest 2.6 cm., strictly erect; flowers

commonly blue, rarely pink or white or intermediate shades; sepals 8-12 mm. long, equaled or exceeded by the straight spur, somewhat densely puberulent on the outside or the alternate ones with a rather definite puberulent band; petals little shorter than the sepals; follicles short-oblong, 6-10 or 14 mm. long, pubescent; seeds with a loose cellular whitish coat, which is produced into narrow wings on the angles.

Moister grassy slopes. May. Pebble Beach Canyon, *Nuttall 499, 694, Knopf 142*. Quite possibly only a race of the preceeding species, with few pink or white flowers.

2. CLEMATIS Linn.

Climbing vines, more or less woody. Leaves opposite, slender-petioled, pinnately compound. Flowers cymose-paniculate, our species dioecious, or nearly so. Sepals 4 or 5, valvate in the bud, spreading, petaloid. Petals none. Stamens numerous, spreading; filaments mostly glabrous; anthers short, blunt. Pistils numerous. Achenes 1-seeded. Style long, persistent, plumose.

1. *C. ligusticifolia* Nutt. T. & Gr. Fl. N. A. 1:9 (1838).

C. ligusticifolia californica Wats. Bot. Calif. 1:3 (1880).

A trailing and climbing vine, nearly glabrous. Leaves pinnately 5-foliolate, the lower pair of leaflets generally remote from the upper; leaflets oblong or ovate-lanceolate, acute and sometimes acuminate at the apex, rounded or cuneate at the base, toothed, lobed or divided; flowers white, in leafy panicles, 12-18 mm. broad when expanded, the stamens about equalling the sepals; filaments glabrous; persistent styles plumose throughout, nearly white, 2.6-5.1 cm. long.

Shadier canyon bottoms. July to September. *Lyon; Trask; Brandegee; Big Wash Canyon, Nuttall 877; Pebble Beach Canyon, Knopf 245; Middle Ranch Canyon, Mills 4579, Nuttall 306, 654, Knopf 231, 237; Eagles Nest, Nuttall 849.* VIRGIN'S BOWER. YERBA DE CHIVATO.

3. RANUNCULUS Linn.

Annual or perennial herbs, with alternate simple entire lobed or divided or dissected leaves, and yellow white or red flowers. Sepals mostly 5, deciduous. Petals equal in number or more, conspicuous or minute, provided with a nectariferous pit and a scale at the base of the blade. Carpels indefinite, 1-ovuled. Achenes capitate or spicate, generally flattened, smooth, papillose or echinate, tipped with a minute or an elongated style.

1. *R. hebecarpus* H. & A. Bot. Beech. 316 (1841).

Somewhat pilose, with spreading hairs, densely so when young:

stems ascending, slender, 15-20 cm. high: lower leaves ternate or 3-parted; the leaflets cuneate at base, and 2-3-lobed; upper ones more divided; petals 5, 2-2.1 mm. long: sepals hairy, about equalling the petals: akenes few in a head, 2 mm. or less long, rounded, flat, the sides rough with short scattered hairs: heads globular, 4.2 mm. in diameter.

In moist, shady places in canyons, infrequent. May. *Trask* (in herb. N. Y.); in a gully at the sharp angle of the Equestrian Trail, *Millsp., Nuttall 161.* BUTTERCUP.

Order 8. PAPAVERALES.

Mostly herbs with clustered, regular and perfect flowers. Petals, with very rare exceptions, present and separate. Sepals usually separate. Stamens hypogynous. Ovary superior, free from the calyx, compound, composed of two or more united carpels.

- | | |
|---|-----------------------|
| Sepals 2 (very rarely 3 or 4); endosperm | |
| fleshy. | Fam. 1. PAPAVERACEÆ. |
| Sepals, or calyx segments, 4-8; endosperm none: | |
| Capsule 1-celled, of 2-6 carpels: | |
| Style short or wanting: | |
| Stipules deciduous. | Fam. 2. CAPPARIDACEÆ. |
| Stipules glandular. | Fam. 3. RESEDACEÆ. |
| Capsule 2-celled by a longitudinal | |
| partition. | Fam. 4. BRASSICACEÆ. |

Family 1. PAPAVERACEÆ.

POPPY FAMILY

Herbs or low shrubs (rarely trees) with milky juice; alternate leaves, often rosulate at the base and subopposite near the flowers; astipulate. Inflorescence terminal or superaxillary, solitary or racemose. Flowers hermaphrodite, regular, hypogynous; sepals 2-3, free (calyptrate in *Eschscholtzia*), imbricate, caducous; petals 4-6 or rarely more, free, biseriate, early deciduous. Stamens many, rarely of definite number, 2-6-meris; filaments mostly filiform; anthers bilocular. Ovary free, of 2-20 carpels; ovules many, anatropous or campylotropous; styles simple or wanting; stigmas as many as the carpels. Fruit a capsule; seeds globose to subreniform, pitted or reticulate.

- | | |
|------------------------------------|-------------------|
| Fruits in clusters moniliform. | 1. PLATYSTEMON. |
| Fruits single: | |
| Siliqueous: | |
| Dehiscent from the base. | 2. DENDROMECON. |
| Dehiscent from the placental ribs. | 3. ESCHSCHOLTZIA. |
| Capsular. | 4. PAPAVER. |

1. **PLATYSTEMON** Benth.

Low annual herbs branching from the leafy base, glaucescent or hirsute. Leaves linear or oblong-lanceolate, apex acute or obtuse, entire, sessile, 3-5 nerved. Flowers solitary on slender, elongate peduncles; sepals 3, ovate, pilose; petals 6, yellowish, rarely persistent. Stamens numerous, unequal; filaments dilated at the apex, subpetaloid; anthers oval or linear, 2-celled, laterally dehiscent; ovaries 6-20, distinct, linear; stigmas sessile, linear with a hairy line on the inner surface. Capsules nearly distinct, torulose or moniliform; seeds smooth or sculptured, pendulous, solitary in each cell, brown.

1. **P. cernuus** Greene Pitton. 5:193 (1903).

A decumbent, branching, leafy herb 8-18 cm. high; branches pilose, hairs long, white. Leaves linear, 2.5-4.5 cm., obtuse, pilose. Peduncles erect (those of the buds nodding), slender, lax-pilose; flowers white to cream, about 1.75-2 cm. diameter, rotate; petals obovate, short-clawed. Filaments all triangulo-obcuneate, attenuated to filiform below about 1 mm., broad above and slightly obcordate, about 6 times as long as the anthers. Stigmas radiant, filiform, hairy. Follicles 10-12, noniliform, about 1.25 cm. long in fruit, with 5-6 short, slightly nerved, indistinctly tuberculate articulations.

Grassy hillsides plentiful where found. March to April. *Brandegee; Trask* (N. Y., Field, U. S., listed as *P. californicus* Benth.); slopes at head of Gallagher's Cañon, *Millsp.* 4878. CREAM CUPS.

Dr. Greene's original description is faulty in regard to "filaments linear" and "carpels villous-hirsute above the middle"; the type is as described above.

2. **DENDROMECON** Benth.

A smooth, branching shrub without latex. Leaves alternate, leathery, entire or subdenticulate. Flowers solitary, large, yellow. Sepals 2, hemispheric, concave, caducous. Petals 4. Stamens many; filaments filiform, short; anthers linear. Ovary linear-oblong; stigmas 2, sessile, short, thickish, erect. Capsule elongate, attenuate, 1-celled, 2-valved splitting throughout into 2, strong, woody valves; placentae marginal, filiform. Seeds many, large, pyriform or sub-globose.

Flowering peduncles not equalling the leaves:

Leaves thin, lax, not reticulate.

Leaves thick, firm, somewhat reticulate.

1. *rharnnoides*.

2. *arborea*.

1. **D. rhannoides** Greene Pitton 5:305 (1905).

Tree 1.5-6 m. high, branches drooping. Leaves large, 5-10 cm. long, broadly oblong or oval, obtuse, with very prominent mucro, not coriaceous but thin like *Rhamnus Purshiana*, not reticulate, margin entire. Peduncles not half the length of the leaves. Corolla about

3.75 cm. broad. Pods about 7.5 cm. long. Seeds usually small, somewhat pyriform, reticulations coarse and distinct.

Dry soil of ridges. In flower the year around. Near the Isthmus. *Dall & Baker* (1874) (Gray, U. S., Field), reported by Fedde in *Pflanzenreich* 40:143. We have not met with the species.

2. *D. arborea idem.*

Tree 1.5-6 m. high with a trunk up to 3 dm. diameter. Leaves rigid, coriaceous, glaucous, 4 cm.x17 mm. to 5x2.5 cm. elliptic, acutish, stoutly mucronate; margin entire but with scattered suggestions of teeth as represented by a minute roughness; very faintly if at all reticulate. Peduncles scarcely as long as the leaves; flowers 5.5-6.5 cm. broad. Pods 8-10 cm. long, tipped by the large, persistent stigma; seeds densely lenticulo-rugose in parallel lines.

On dry ridges and volcanic cliffs. In flower the year around. *Trask* (N. Y., U. S., Field); I have seen but two trees, 2-3.5 m. high, between Howland's and Johnson's Landing, March 17, 1920, *Mills* sp. 4815; *Knopf* 183, 184, 186. TREE POPPY.

D. rigida Benth. is credited to Catalina by *Lyon* and by *Brandegee* (*Zoe* 1:46; 1:132 with synonyms *D. Harfordii* and *D. flexile*), the Brandegee specimen in this herbarium and in the U. S. Natl. herb., is plainly *D. arborea* Greene. *Mrs. Trask* refers her observations doubtfully to *D. Harfordii* Kell. (*Erythr.* 7:145), her remarks however lead me to judge that she had Dr. Greene's *D. rhamnoides* under observation, she says: "Very rare..... I have seen but 18 trees during all my trips about the island," she indicates a leaning habit for the species and that it required support to gain large growth as it is "very brittle." Dr. *Jepson* records (*Field Notes MSS.*) a conversation with *Mrs. Trask* in which she stated: "A distinct tree, with a trunk a foot in diameter. The crown usually bends over, especially when large: it can not hold its head erect. There are no young poppy trees on the island and no seedlings"; he adds: "I think she added 'no crown sprouts'"

D. flexile Greene, Dr. Greene says (*Pitton*, 5: 306): "A species which also seems to inhabit Catalina." An unauthenticated statement.

3. *ESCHSCHOLTZIA* Cham.

Weak, more or less glabrous and glaucous herbs, from a strong, elongated, tap-root; without latex. Leaves alternate, pinnately dissected and multifid the segments mostly narrow and linear. Flowers solitary, yellow or orange, generally long-peduncled; sepals 2, marginally coherent in a deciduous, pointed calypter cleaving away from a more or less collared torus; petals 4, borne on the torus. Stamens numerous; filaments short; anthers linear. Ovary linear-cylindric

with 2, nerve-like placentae; style short; stigmas divided into 4-6 linear, unequal, divergent lobes. Capsule elongate, 10-nerved, 1-celled, dehiscent by 2 valves separating from placental ribs. Seeds globose, reticulate or tuberculate. CALIFORNIA POPPY.

Calypter elongate-conical:

Tip terete.

Tip tapering.

Calypter short-ovoid.

1. Wrigleyana.

2. californica.

3. elegans.

1. **E. Wrigleyana** sp. nov. (Plate I, Frontispiece).

Herba, perennis?, radice principali longa gravique; glaucescens, ad basim demum plus minusve ramosa. Folia ad aetatis gradum juvenilem florentem multa et omnia e radice orta, 10-19 cm. longa; laminis quam petiolis circ. dimidio brevioribus, 4-pinnatifidis; pinnis 5, rursus 5-partitis, segmentis ultimis lanceolato-spathulatis acutis in bina vel trina adgregatis. Pedunculus floris centralis 18 cm. longus, ei florum ramorum seniorum 10-12 cm. longi, omnes 8-costati; toro campanulato 5-8 mm. longo, limbo libero panso foliaceo. circ. 4 mm. lato; calyce (calypstro) conico, 2.5-3 cm. longo et ad basim 12 mm. lato, sensim in rostrum abruptum tenue teres circ. 5 mm. longum angustato. Petala aurantiaco-flava, late flabelliformis, 5x5 cm. flore panso 11-12 cm. lato. Stamina circ. 24; filamentis brevibus, ligulatis, purpureis, 5 mm. longis; antheris lineari-oblongis, 1 cm. longis. Styli plerumque 4 in jugis inaequalibus, infra sepe corporibus stylorum usque ad 4 abortivorum obsiti, marginibus latis stigmaticis alatoideis comparati.

I take pleasure in dedicating this striking species to Mr. William Wrigley, Jr., who forwarded our work on this Flora through many courtesies extended to our collectors. He also materially aided us in our search through herbaria at Cambridge, New York and Washington.

Two young plants only seen not found later. Among the coarse pebbles of the arroya at the mouth of Big Wash Cañon, March 24, 1920, *Mills* sp. 4854. WRIGLEY'S POPPY.

Near *E. crocea* Benth. (an interior valley species) but all known characters larger and apparently quite distinct. It also differs in presenting, at first, a scapiform flower. By far the most gorgeous of all the *Eschscholtzias*.

2. **E. californica** Cham. Nees. Hor. Phys. Ber. 73 (1820)

Stems scapose or leafy, erect or diffuse, 22.9 cm.-6.8 dm. high; basal leaves ternately several times dissected into linear or oblong segments, on long or short petioles, the whole leaf 10.1 cm.-3.3 dm. long; cauline smaller on short petioles; peduncles 5.1 or 7.6-15.3 cm. long; petals fan-shaped, 12.7 mm.-5.1 cm. long, varying from deep orange or copper-color to straw color; outer spreading rim of the receptacle commonly 1.05-4.2 mm. wide, the inner erect rim hyaline; capsule 2.6-7.6 or even 10.1 cm. long.

Grassy hillsides general. March to May. *Trask*; Ridge between Rock Falls and Rock Spring Cañons, *Moxley* 692; Slopes of Mt. Martha, *Mills* sp. 4836, *Nuttall* 121; Hamilton Cañon, *Mills* sp. 4702; between Howland's and Johnson's Landings, *Mills* sp. 4816; upper Pebble Beach Road, *Knopf* 72, 86.

3. ***E. elegans*** Greene Bull. Calif. Acad. 1:182 (1885).

An annual, erect herb, 3-6 dm. high, very leafy especially toward the base and with numerous long, ascending and somewhat naked branches. Leaves glabrous, glaucescent, compact, cut into very many, almost parallel, oblong-linear to linear, acutish segments. Torus narrowly campanulate; crown narrow, purplish. Calyx calypter scarcely 12 mm. long, short-ovoid, tip deltoid, apiculate. Corolla rotate, about 2.5 cm. wide. Stamens 16-20; filaments and anthers often about equal in length. Pods slender, about 9 cm. long, thin-walled; seeds oval, mucronate at both ends, not reticulate, indistinctly tuberculate.

Grassy hillsides and drier situations. April to July. Hillsides near Avalon, *Smith* 4972, *Nuttall* 27; slopes of mountain beyond Pebble Beach, *Mills* sp. 4847, *Nuttall* 690; hillside near Middle Ranch, *Nuttall* 656. Elevated rocky slopes, *Brandegee* (1889) listed as *E. californica* Cham.; on high, dry hills of the Hay Press Trail, *Mrs. Trask* (1895) listed as *E. ramosa* Greene; hillside near Hamilton Beach, *Mills* sp. 4897; hillside along Pebble Beach Road and on the west hillside and Catalina Harbor, *Nuttall* 68, 256.

We include here *E. crossophylla* and *E. ramosa*.

4. **PAPAVER** Linn.

Sap milky. Leaves lobed or dissected, alternate. Flowers and flower-buds nodding. Sepals 2 or occasionally 3. Petals 4-6. Stamens indefinite. Anthers extrorse. Ovules indefinite borne on numerous internally-projecting placentae. Stigmas united into a radiate persistent disk. Capsule globose, obovoid, or oblong, dehiscent near the summit. Seeds marked with minute depressions.

1. ***P. heterophyllum*** Greene, Pitton. 1:168 (1888).

Meconopsis heterophylla Benth. Trans. Hort. Soc. 2, 1:408 (1835).

A glabrous or sparsely pilose-pubescent annual herb, 3-6 dm. high, simple or branching. Leaves somewhat succulent, pinnately parted or divided, mostly petioled. Peduncles slender. Petals 1-2 cm. long, orange-red. Capsule obovate to turbinate, dehiscent by 8 opercules.

Moist, shady situations in cañons. March to April. *Mrs. Trask*, who says on her specimen in U. S. Natl. Herb. 340154: "Seldom met with;" *Knopf* collects it on the hillside of the first right hand branch of Pebble Beach Canyon, 39. WIND POPPY.

Family 2. **CAPPARIDACEÆ.**

CAPER FAMILY

Herbs or shrubs with pungent or acrid watery juice, simple or palmately compound alternate leaves and axillary or terminal, mostly regular, flowers. Sepals 4. Petals 4, sessile or clawed. Stamens usually 6, equal, inserted on the receptacle; anthers oblong, longitudinally dehiscent. Ovary sessile or usually stipitate, 1-celled; ovules many, borne on parietal placentae. Fruit a capsule or berry; seeds mostly reniform; endosperm none; cotyledons somewhat coiled.

1. **ISOMERIS** Nutt.

Tree-like shrubs 8-18 dm. high, much branched and spreading. Leaves crowded, 3-foliate. Inflorescence in dense, terminal racemes. Sepals united below, somewhat spreading, marcescent. Petals 4, oblong, sessile, regular, torus fleshy, subhemispherical, produced into a small, dilated appendage on the upper side. Stamens 6, filaments equal, much exserted. Ovary borne on a long stipe. Capsule inflated, coriaceous, indehiscent, stipitate, crowned with the persistent style. Seeds large, several on each parietal placenta; cotyledons incumbently incurved.

1. **I. arborea** Nutt. T. & Gr. Fl. N. A. 1:124 (1838).

A spreading, much branched shrub the young parts minutely pubescent. Leaflets lanceolate, mucronulate, glabrous. Calyx campanulate the lobes ovate-triangular, acuminate. Petals slightly spreading, ovate, blunt. Ovary elongate-pyriform; style short; stigma minute. Capsule inflated, fusiform, varying as to its length in proportion to the stipe. Seeds globular-ovoid, reddish-brown, mottled, 10x12 mm.

Sea cliffs and dry hillsides. In bloom the year around; in best fruit in September and October. *Brandegee*; *Trask*; sea cliffs near Avalon, *Grant* 615, *Hall* 8282, *Eastwood* 6446, *Pendleton* 1350, *Grant* 615, *Smith* 5933, *Millsp.* 4520, *Nuttall* 66, 839; Cottonwood Cañon, *Nuttall* 855; Isthmus, hillside near Catalina Harbor, *Millsp.* 4828, *Nuttall* 908, Silver Canyon, 749; *Blake* 968, *Knopf* 0. **BLADDER-POD. CAPER BUSH.**

There are several races of the species both on the mainland and on Catalina, they do not differ sufficiently to merit varietal rank. *Isomeris arborea globosa*, Coville (Proc. Biol. Soc. Wash. 7:73 (1892) (is however specifically distinct, as suggested by Heller (*I. globosa* Heller Muhlenb. 2:50 1905) who collected it at Coville's station, Caliente, Kern Co., Calif. Specimens from the coast region that have been credited to *globosa* are, however, *arborea* so far as we have seen them.* The ovary and pod of *I. globosa* are abrupt at the base, not narrowed to the stipe as in *arborea*; the seed of the former is golden-yellow and not mottled, it is also larger (11x15 mm.); the peduncle of the flower fully a third longer than in *arborea*, the petals broader and the style shorter.

*See *Frythea* 6:88; Bull. N. Y. Bot. Gard. 6:364. Note also *F. E. & E. S. Clements'* specimen from La Jolla, Calif. No. 24, a station from which I also collected the species, *Millsp.* 4458.

Family 3. **RESEDACEÆ.**

RESEDA FAMILY

Herbs with simple alternate leaves and gland-like stipules. Flowers racemose, perfect, irregular. 4-7. Petals 2-7, laciniate. Stamens indefinite, borne (usually) on the inside of a fleshy disk which is enlarged on the upper side. Pistil superior, composed of 3-6 carpels, 1-celled, with 3-6 parietal placentae; Fruit dehiscent at the apex before the seeds are mature. Stigmas 3-6, minute, sessile.

Disk present, petals 4.

1. **RESEDA.**

Disk absent, petals 2.

2. **OLIGOMERIS.**

1. **RESEDA** Linn.

Petals 4, toothed or cleft at the border. Stamens 8-30. Capsule 3-6-lobed, horned. Other characters as in the family.

1. **R. odorata** Linn. Syst. ed. x:1046 (1759).

Stems decumbent or ascending, 1.5-2.5 dm. high. Leaves spatulate-oblong, entire. Raceme broad and somewhat open. Flowers very fragrant, about 4 mm. broad, greenish-white. Anthers brick-red.

A Mediterranean and garden species plentifully established at various points on the grassy slopes of Avalon, Descanso and Hamilton Cañons. March to May. East slope of Descanso Cañon, *Mills* sp. 4914. **MIGNONETTE.**

2. **OLIGOMERIS** Cambess.

Mostly annuals, low and glaucous with entire, linear leaves and small greenish flowers in terminal spikes. Stamens usually 4. Petals 2, posterior free or united at the base, persistent, entire or 2-3-lobed. Disk wanting. Ovary 4-angled, 4-beaked. Capsule 4-grooved, many-seeded.

1. **O. glaucescens** Cambess. Jacquem. Voy. 4:t. 25 (1844).

O. subulata Webb Frag. Fl. Aeth. 26 (1854).

Annual or biennial, 15-25 cm. high, branching at the base the branches ascending. Leaves somewhat succous, often fascicled, 1-2 cm. long. Spikes terminal, elongate, the branches stem-like and bracteate, densely flowered. Petals oblong, obscurely lobed, posterior. Stamens 3, posterior. Capsule depressed-globose, 3 mm. in diameter, 4-lobed, 4-cuspidate. Seeds smooth.

An apparently indigenous species abundant on the Channel Islands, growing in saline situations. March to June. Listed by *Brandegee* and by *Lyon* from Catalina. We have not met with the plant. **MIGNONETTE.**

Family 4. **BRASSICACEÆ.**

MUSTARD FAMILY

Herbs, rarely somewhat woody, with acrid watery sap, alternate leaves and racemose or corymbose flowers. Sepals 4, deciduous or rarely persistent the two outer narrow, the inner similar or concave, or saccate at the base. Petals 4, hypogynous, cruciate, nearly equal, generally clawed. Stamens 6, rarely fewer, hypogynous, tetradynamous. Pistil 1, compound, consisting of 2, united carpels, the parietal placentae united by a dissepiment; style generally persistent, sometimes absent; stigma discoid or usually more or less 2-lobed. Fruit a silique or silicle, generally 2-celled, rarely 1-celled, in a few genera indehiscent. Seeds attached to both sides of the septum; endosperm none; cotyledons incumbent, accumbent or conduplicate.

Pods not elongated; short linear or orbicular:

Pubescence stellate or forked;

Pods dehiscent.

Flat, obcordate.

Linear-oblong.

1. BURSA.

2. SOPHIA.

Pubescence simple or wanting:

Pods dehiscent.

Lenticulo-orbicular.

Ovate to ovate-cordate.

Cylindric.

3. KONIGIA.

4. LEPIDIUM.

5. SISYMBRIUM.

Pods indehiscent, flat, orbicular.

6. THYSANOCARPUS.

Pods elongated, terete:

Short beaked, not turgid;

Somewhat constricted between the seeds.

Short stipitate.

Sessile.

Not constricted, long terete.

Long beaked, turgid.

Dehiscent.

Indehiscent.

7. THELYPODIUM.

8. CARDAMINE.

9. NORTA.

10. BRASSICA.

11. RAPHANUS.

1. **BURSA** Weber.

Annual or winter-annual erect herbs, pubescent with forked hairs; basal leaves tufted. Flowers racemose, small, white. Silicles cuneate, obcordate or triangular, compressed at right angles with the septum, the valves boat-shaped, keeled. Style short. Seeds numerous, marginless; cotyledons accumbent.

1. **B. Bursa-pastoris** (L.) Britton Mem. Torr. Club 5:172 (1894).

Capsella Bursa-pastoris Medic. Pf. Gatt. 1:85 (1792).

Thlaspi Bursa-pastoris Linn. Sp. Pl. 647 (1753).

Erect, branching, 1.5-2.5 dm. high from a long, deep root, pubescent below generally glabrous above. Basal leaves more or less pinatifid or lobed forming a flat rosette, rarely entire 5-12 cm. long; stem-leaves few, lanceolate, auricled, dentate or entire. Flowers white,

about 2 mm. long; pedicels slender, spreading or ascending, 10-15 mm. long in fruit. Pods triangulo-obcordate tipped with the short, persistent style, about 4-8 mm. long; seeds 10-12 in each cell.

Dry, open situations. February to November. *Trask* (N. Y., Field); *Brandege*; *Lyon*; Avalon, on the Golf Course, *Mills* p. 4519. SHEPHERD'S PURSE.

2. SOPHIA Adans.

Annual or perennial herbs (some exotic species shrubby), canescent or pubescent with short forked hairs, with slender branching stems, 2-pinnatifid or finely dissected leaves, and small yellow flowers in terminal racemes, the racemes much elongating in fruit. Calyx early deciduous. Style very short; stigma simple. Siliques linear or linear-oblong, slender-pedicelled, the valves 1-nerved. Seeds very small, oblong, wingless, in 1 or 2 rows in each cell; cotyledons incumbent.

1. *S. pinnata* (Walt) Howell Fl. N. W. Am. 1:56 (1897).
Erysimum pinnatum Walt. Fl. Carol. 174 (1788).
Sisymbrium canescens Nutt. Gen. 2:68 (1818).

Glabrate, somewhat canescent with branched hairs or densely so; stem erect, branched, 2-14 dm. high, slender, the branches ascending. Leaves 5-10 cm. long, oblong in general outline, bipinnatifid into very numerous, small toothed or entire, obtuse segments. Pedicels very slender, spreading to nearly right angles to the axis, 1.15 cm. long. Flowers 2-3 mm. broad. Pods horizontal or ascending, oblong or linear-oblong, compressed, 6-8 mm. long by 2 mm. broad, glabrous or somewhat canescent; style minute. Seeds plainly in 2 rows in each cell.

Dry situations. March to July. *Brandege*: Pacific slope beyond the summit of the Equestrian Trail, *Mills* p. 4775; on the Equestrian Trail at 1000 ft. alt., *Nuttall* 328; Avalon Hill, *Knopf* 429. HEDGE MUSTARD.

3. KONIGIA Adans.

Perennial herbs or shrubs, pubescent, or canescent with forked hairs. Leaves entire. Flowers small, white, in terminal racemes; petals obovate, entire. Filaments slender, not toothed but with 2 small glands at the base. Pods compressed, oval or orbicular. Seeds 1 in each cell; cotyledons accumbent.

1. *K. maritima* (L.) R. Br. Denh. & Clapp Nar. Exp. Afr. 214 (1826).

Alyssum maritimum Lam. Encyc. 1:98 (1783).

Clypeola maritima Linn. Sp. Pl. 652 (1753).

Procumbent or ascending, freely branching, 1-3 dm. high, minutely

pubescent with straight, appressed hairs. Stem-leaves nearly sessile, lanceolate or linear 7-15 x 2-5 mm., basal-leaves oblanceolate, narrowed to a petiole. Flowers white, fragrant, about 4 mm. broad; pedicels ascending, 6-8 mm. long in fruit. Pods glabrous, pointed, oval or nearly orbicular, 2-3 mm. Calyx deciduous; stamens not appendaged.

A European plant escaped from gardens. January to September. Established in waste grounds in several situations near Avalon. Cliff edge. *Mrs. Trask* (N. Y., Field), on the west hillside, *Mills* sp. 4634. SWEET ALYSSUM.

4. LEPIDIUM Linn.

Erect or rarely diffuse herbs with pinnatifid lobed or entire leaves and racemose white or whitish flowers. Stamens often fewer than 6. Petals short, sometimes wanting. Pods oblong to orbicular, flattened contrary to the partition, winged or wingless; valves keeled, dehiscent. Seeds solitary in each cell, flattened; cotyledons incumbent or rarely accumbent.

Pedicels flattened:

Pods strongly winged at apex:

Pods reticulate.

Pods not reticulate:

Pods hairy.

Pods glabrous.

Pedicels terete:

Pods slightly winged at apex.

1. *latipes*.

2. *lasiocarpum*.

3. *nitidum*.

4. *medium*.

1. *L. latipes* Hook. Ic. Pl. t. 41 (1837).

A low, prostrate herb hispid with short, spreading hairs or the leaves sometimes glabrous; stems several, stout, simple 2.5-7 cm. long; leaves exceeding the stems, irregularly and coarsely pinnatifid the segments linear and entire or lobed. Racemes short and cylindrical-capitate 2.5 cm. or less long in fruit; pedicels 2-4 mm.; sepals very unequal; petals broadly spatulate, ciliate, greenish-white 2-4 mm. long, much exceeding the sepals. Pod broadly oval, 4 mm. broad, sparingly pubescent, strongly reticulated, the broad, acute wings nearly as long as the pod.

Saline flats. March. Forming a close carpet in places on the flat at Pebble Beach, *Trask* (N. Y., Field); *Mills* sp. 4729.

2. *L. lasiocarpum* Nutt. T. & Gr. Fl. N. A. 1:115 (1838).

An erect or decumbent herb roughly pubescent or puberulent with short, spreading hairs; stems rather stout, branched, 7-25 cm. high; lower leaves 7-10 cm. long, more or less ciliolate at least on the petioles, pinnate, with ovate to oblong sparingly toothed segments; upper leaves 2.5-5 cm. long incisely pinnatifid, lobes narrow, or the uppermost entire. Petals none or very small; stamens 2; pods rounded, 3-4.5 mm. broad, hispid on the margin winged at the apex, with short, obtuse teeth, crowded in a narrow raceme on short, ascending or horizontal pedicels.

Among dry pebbles of arroyos and beaches. January to April. *Dall & Baker* (Gray, Field); *Trask* (N. Y., Field); *Brandegee**; Catalina Harbor on Ballast Point, *Millsp.* 4614, 4791. SMOOTH PEPPERGRASS.

3. *L. nitidum* Nutt. T. & Gr. *idid* 116.

An erect herb, glabrous or somewhat pubescent; stems simple or branched, 6-24 cm. high; leaves pinnately cut into narrow linear acuminate segments, the uppermost often entire. Petals small. Pods in a loose raceme, spreading, glabrous and mostly shining, rounded, 3-4.5 mm. broad, acutely and mostly colorate margined, the wings short, obtuse and slightly spreading, pedicels 2-4 mm. long.

Dry, open, barren places. January to April. *Brandegee*. Avalon, on Reservoir Hill; on the flat at Pebble Beach; Hay Press near the Coach Road; hillsides at the Isthmus, *Millsp.* 4906, 4476, 4678, 4625. HAIRY PEPPERGRASS.

4. *L. medium* Greene Erythr. 3:36 (1895).

L. intermedium Gray Pl. Wr. 2:15 (1853) not A. Rich. (1847).

An erect and branching herb with the general habit of *L. virginicum*, 1.5-4 dm. high, glabrous or puberulent on the stems and branches. Lower leaves 2.5-5 cm. long, toothed or pinnatifid, the upper oblong or linear entire or indefinitely toothed. Petals wanting. Pods smooth or rarely slightly puberulent, rounded, 2-3 mm. broad, very shortly winged at apex; pedicels spreading, about 4 mm. long.

Dry, open situations. April to May. Avalon, on the Golf Links, *Nuttall* 167. *Knopf* 324.

5. *SISYMBRIUM* Linn.

An aquatic or uliginose herb with pinnately divided leaves and small white flowers in terminal racemes. Pods linear to linear-oblong, slender pedicelled, tipped with the rather stout style. Valves nerveless. Seeds in 2 rows in each cell. Cotyledons accumbent.

1. *S. Nasturtium-aquaticum* Linn. Sp. Pl. 657 (1753).

Nasturtium officinale R. Br. Ait. Hort. Kew. ed. 2, 4:110 (1812).

Glabrous, branching, floating or creeping, rooting from the nodes. Leaves pinnately divided into 3-9 segments the terminal larger, obtuse, ovate or oval or the terminal lobe nearly orbicular. Racemes elongated in fruit; flowers 4-5 mm. broad; petals twice the length of the calyx. Pods slightly curved upward, 12-30 x 2 mm. on spreading pedicels about half their length; seeds distinctly in 2 rows.

A European plant established in perpetual streamlets. July to September. *Brandegee*; Middle Ranch Creek, *Smith* 5113, *Nuttall* 758, 896; Cottonwood Creek near the mouth, *Nuttall* 852, *Knopf* 227. WATERCRESS.

**L. lasiophyllum* (Brandegee misprint in his "Plants of Santa Rosa Island.")

6. THYSANOCARPUS Hook.

Erect, slender, sparingly branched annuals with minute, white or rose-colored flowers in elongated racemes. Fruit mostly pendulous on slender pedicels; pods 1-celled, indehiscent, plano-convex and greatly compressed, orbicular, winged or margined, 1-seeded. Seeds pendulous, somewhat flattened, not alate.

1. *T. laciniatus* Nutt. T. & Gr. Fl. N. A. 1:118 (1838).

A smooth, slender, somewhat glaucous annual 2-4 dm. high. Leaves rather thin not forming a rosette at the base, linear, entire or deeply pinnatifid into narrow, linear segments; upper leaves entire, 20-30 mm. long, 2-4 mm. wide, narrowed at the base. Racemes 10-25 cm. long. Pods orbicular or nearly so, 3-3.5 mm. in diameter including the entire or slightly and irregular crenate border, glabrous, pulverulent or sometimes minutely pubescent; pedicels slender, spreading, generally deflexed.

Dry, open situations. February to June. *Trask* (N. Y., Field); *Brandegee*; Avalon Cañon near the Golf Links, *Mills* 4721, 4731; Equestrian Trail, *Nuttall* 163, 1076. LACE-POD.

There appear to be many races of the species both on the island and the main land, races that intermix in all characters sufficiently to exclude Dr. Greene's *T. affinis* and *T. ramosus* from specific distinction. Pringle's specimens from "Mountains, San Diego Co." have the hirtellous pods of *T. affinis*, yet they have the wide scarious margin of *laciniatus* and *ramosus*. The leaf characters are very various in all specimens that we have examined.

7. THELYPODIUM Endl.

Erect, glabrate, biennial or perennial herbs with simple, entire, toothed or pinnatifid leaves and racemose white or purplish flowers. Pods nearly terete, linear, with a short stipe in some species; valves nerved, dehiscent. Style short; stigma nearly entire. Seeds in one row in each cell, oblong, marginless. Cotyledons obliquely incumbent.

1. *T. lasiophyllum* (Hook. & Arn.) Greene Bull. Torr. Club 13:142 (1886).

Turritis lasiophylla H. & A. Bot. Beech. 321 (1841).

Sisymbrium reflexum Nutt. Pl. Gambel. 183 (1848).

Erect, annual, simple or sparingly branched above the middle, hispid below, often smoothish above. Leaves oblanceolate in general outline, irregularly sinuate toothed or pinnatifid with spreading, acute, entire or toothed segments; 4-12 cm. long, distinctly petioled or the upper sessile by a narrow base. Inflorescence racemose. Sepals oblong, one-half as long as the petals; petals narrow, spatulate, 3-5 mm. long, yellowish-white or pale rose. Pods usually deflexed or widely spreading, slender, attenuate, 3-5 cm. long on pedicles 2-3 mm. long.

Dry situations. March to July. *Brandegee*; Along Pebble Beach Road and on the flat at the beach, *Smith 5062*; *Mills* 4751; *Nuttall 62, 209*.

[*T. laciniatum* Endl. is reported doubtfully in Brandegee's list. It does not appear in any of the collections from the island that we have examined.].

8. CARDAMINE Linn.

Erect or ascending herbs with scaly or bulbiferous rootstocks, or fibrous roots. Leaves entire, lobed or divided. Flowers white or purple, in racemes or corymbs. Stamens 6, rarely 4. Pods elongated, flat, generally erect, elastically dehiscent at maturity; valves nerveless or but faintly nerved. Stipe wanting. Seeds in 1 row in each cell, compressed, marginless. Cotyledons equal or unequal, accumbent.

1. *C. paucisecta* Benth. Pl. Hartw. 297 (1830).
Dentaria californica Nutt. T. & G. Fl. N. A. 1:88 (1838).

Rootstalk slender, tubers small; stem 2-3 dm. high, rather stout, simple or branched above, glabrous or nearly so. Leaves: basal entire or 3-foliate, the leaflets petiolulate, suborbicular, sinuate or coarsely toothed; cauline 2-4, mostly short-petioled and above the middle of the stem, deeply lobed or pinnately 3-foliate, rarely simple; leaflets mostly petiolulate, ovate or lanceolate-linear, entire or toothed, 2-7 cm. long. Flowers white or rose colored. Pods 2-6 cm. long; style 4-6 mm. long. Seeds oblong.

In damp, shady situations in rich soil beneath trees. March to May. *Dall & Baker* (Gray: Field); *Trask* (N. Y., Field). Woodland bordering the Coach Road between Cherry Valley and Howland's Landing, March 17, 1920, *Mills* 4808.

9. NORTA Adans.

Biennial herbs with alternate pinnatifid or dentate leaves and medium sized yellow flowers. Pubescence when present of simple hairs. Sepals spreading. Pods narrowly linear, much elongated, terete or nearly so, divergent or ascending. Stigma 2-lobed. Seeds in 1 or 2 rows in each cell, oblong, not winged. Cotyledons incumbent.

1. *N. altissima* (L.) Britton Brit. & Brown Ill. Flora 2:174 (1913).
Sisymbrium altissimum Linn. Sp. Pl. 659 (1753).
Sisymbrium pannonicum Jacq. Coll. 1:70 (1786).

Erect, 6-12 dm. high, freely branching, glabrous or nearly so. Lowest leaves runcinate-pinnatifid, petioled, the lobes lanceolate, often auriculate; upper leaves smaller, shorter petioled or nearly sessile, very deeply pinnatifid, the lobes linear or lanceolate, dentate or entire, often

with a narrow projection on the lower side near the base; uppermost leaves often reduced to linear nearly entire bracts. Flowers yellowish, about 6 mm. broad; pedicels 6-8 mm. long spreading or ascending, thickened in fruit. Pods very narrowly linear, stiff, divergent, 5-10 cm. long, 1 mm. wide, valves with a prominent midrib.

Dry, open situations. January to July. Avalon, on the Golf Links and near Chicken Johnny's, *Millsp.* 4635, 4661, 4543; on freshly turned soil along the Equestrian Trail, *Nuttall* 165.

10. BRASSICA Linn.

Erect branching herbs with pinnatifid basal leaves and showy yellow flowers in elongated racemes. Pod elongated, sessile, terete or 4-sided, tipped with an indehiscent, conic, usually 1-seeded beak; valves convex, 1-3-nerved; seeds oblong, marginless, in one row in each cell. Cotyledons conduplicate.

Leaves not clasping the stem, upper sessile.

Leaves clasping the stem.

1. *nigra*.

2. *campestris*.

1. *B. nigra* (L.) Koch, Roehl. Deutsche Fl. Ed. 3, 4:713 (1833).

Annual, erect .75-2.25 m. high, freely and widely branching, pubescent or glabrate. Lower leaves slender petioled, deeply pinnatifid with 1 terminal large lobe and 2-4 smaller lateral ones, all dentate throughout; upper leaves shorter petioled or sessile, pinnatifid or dentate; the uppermost reduced to lanceolate or oblong, entire. Flowers bright yellow 7-10 mm. broad; pedicels slender, appressed 4 mm. long in fruit. Pods narrowly linear, 4-angled, 1-1.5 cm. long appressed against the rachis forming narrow racemes; beak slender; seeds dark brown.

Roadsides, open, waste grounds and cultivated fields. February to July. *Brandegee*; *Trask* (N. Y., Field); Avalon, on the Golf Links and at the Wishbone on the Coach Road, *Millsp.* 4766, 4681; Cottonwood Canyon, *Knopf* 398; *Nuttall* 213. BLACK MUSTARD, WILD MUSTARD.

2. *B. campestris* Linn. Sp. Pl. 666 (1753).

Biennial, stem 3 dm. to 1 m. high, branching, glabrous and glaucous or sometimes slightly pubescent below. Lower leaves petioled, pubescent, more or less lobed or pinnatifid; upper lanceolate or oblong, acute or obtusish, sessile and clasping the stem by an auricled base, entire or dentate, glabrous. Flowers bright yellow, 8-10 mm. broad; pedicels spreading or ascending, often 2.5 cm. long in fruit. Pods 3.5-5 cm. long tipped with a beak 8-11 mm. long.

Roadsides, waste places and cultivated fields. March to July. Avalon, on the Golf Links, *Millsp.* 4767. FIELD MUSTARD.

11. RAPHANUS Linn.

Erect or widely branching from the base, annual or biennial herbs. Leaves lyrate. Flowers showy. Pod elongated, fleshy or corky,

constricted between the seeds or continuous and spongy. Indehiscent. Seeds globose; cotyledons conduplicate.

1. **R. sativus** Linn. Sp. Pl. 669 (1753).

Biennial or annual from a more or less fleshy root; erect and freely branching, 3-5 dm. high, sparsely pubescent with stiff hairs especially near the base, sometimes glabrous above. Lower leaves deeply lyrate-pinnatifid, segments crenate or dentate. Flowers white, pink or purplish, 12-18 mm. broad. Pods large, mostly smooth or longitudinally lined, corky, slightly grooved between the seeds when fully mature, beak conical, 1-2 cm. long; seeds 2-several.

Ditches and cultivated fields. January to June. Avalon, fields and ditches beyond the Golf Links, *Millsp.* 4732, *Nuttall* 133, 582, 746; along the Coach Road near the Summit, *Millsp.* 4581; White's Valley, *Knopf* 93. WILD RADISH.

Order 9. ROSALES.

Herbs, shrubs or trees, the flowers usually petaliferous and the petals distinct. Stamens mostly perigynous or epigynous. Sepals mainly united or confluent with the concave receptacle. Carpels one or more, distinct or sometimes united into a compound ovary.

Flowers regular:

Endosperm present:

Herbs:

Carpels as many as sepals.

Carpels mostly 2.

Shrubs or trees:

Fruit a berry.

Fruit a follicle.

Endosperm wanting:

Seeds with a fimbriate aril.

Seeds without an aril:

Carpels distinct or berry-like.

Carpels united in a pome.

Carpels solitary fruit a drupe.

Flowers irregular:

Fruit a legume.

1. CRASSULACEAE.

2. SAXIFRAGACEAE.

3. GROSSULARIACEAE.

4. CUNONIACEAE.

5. CROSSOSOMATACEAE.

6. ROSACEAE.

7. MALACEAE.

8. AMYGDALACEAE.

9. FABACEAE.

Family 1. CRASSULACEÆ.

ORPINE FAMILY

Herbs, or somewhat shrubby plants, mostly fleshy or succulent, with cymose, or rarely racemose or solitary, regular, symmetrical, mostly perfect flowers. Stipules none. Calyx persistent, free from the ovary or ovaries, mostly 4-5-parted or 4-5-lobed. Petals equal in number to the calyx-segments, distinct, or more or less united, usually persistent, rarely wanting. Stamens of the same number or twice as many as the petals: anthers longitudinally dehiscent. Receptacle

usually with a scale at the base of each carpel. Carpels equal in number to the sepals, distinct, or united below; styles subulate or filiform; ovules numerous, arranged in 2 rows along the ventral suture, rarely few, or solitary. Follicles 1-celled, dehiscent along the ventral suture. Seeds minute; endosperm fleshy; embryo terete; cotyledons short, obtuse.

Stamens as many as the calyx lobes:

Flowers clustered, carpels 1-2-seeded.

1. TILLAEA

Stamens twice as many as the calyx lobes:

Corolla tubular, lobes long, erect.

2. DUDLEYA.

Corolla short-campanulate, lobes spreading. 3. STYLOPHYLLUM.

1. TILLAEA Linn.

Minute glabrous annual herbs, with opposite entire leaves and very small axillary, clustered flowers. Calyx 3-5-parted. Petals 3-5, distinct, or united at the base. Carpels 3-5, distinct, styles short, subulate. Ovules usually few. Carpels 1-2-seeded.

1. *T. erecta* H. & A. Bot. Voy. 24 (1830).

Tillaea minima Miers. H. & A. in Hook. Bot. Misc. 3:338 (1833).

Tufted, branched, 8 cm. high or less, the branches erect or ascending. Leaves connate at base, ovate to oblong, acute, 1.5-3 mm. long; flowers in axillary bracted clusters; pedicels very short, or often filiform and as long as the leaves or longer; sepals mostly 4, ovate, acute, about 1 mm. long, somewhat longer than the narrowly lanceolate acuminate petals; seeds commonly solitary.

In exposed sandy soils. February to May. *Lyon; Trask; Brandegee*; sandy bottom land at Howland's, *Millsp.* 4811; Avalon Valley, right hand hollow below Chicken Johnny's, *Nuttall* 143; Pacific slope of the Salta Verde, *Knopf* 384.

Brandegee lists *Tillaea angustifolia* as common on Catalina. We have been unable either to find a specimen of his or other collecting, nor have our collectors seen the plant. His reference may possibly be correct as it is found on the mainland at San Diego, but the species cannot be "common" on the island.

2. DUDLEYA Britton & Rose.

Caulescent or acaulescent perennials with flat linear to ovate basal leaves, and yellow, orange, red or rarely white flowers mostly in panicles. Leaves of the flowering branches usually much shorter and relatively broader than the basal ones, sessile or clasping. Calyx conspicuous, 5-lobed, the lobes erect, linear-lanceolate to ovate, obtuse to acuminate. Corolla nearly cylindric, or somewhat angled, the segments united below the middle, erect, or their tips somewhat spreading, obtuse or acuminate. Stamens twice as many as the calyx-lobes, distinct. Carpels erect, many-seeded.

1. **D. Greenei** Rose Bull. N. Y. Bot. Gard. 3: 17 (1903).

Caudex short and thick. Leaves in rosettes, numerous, strap-shaped, 6-7 cm. long, 15 mm. broad at base, acute, very glaucous, drying thick and leathery; flowering stalk 3-4 dm. high, bearing scattered ovate-acuminate leaves; inflorescence consisting of numerous secund racemes; pedicels stout, ascending, 2-4 mm. long; calyx 4 mm. high, deeply 5-parted, the lobes broadly lanceolate, acute; corolla 8-10 mm. long, its tube 2 mm. long.

Dry rockfaces near the sea. April to June. *Trask*; *McClatchie* (as *Cotyledon caespitosum*); *Mrs. C. E. Miller*; vicinity of Avalon, *Eastwood* 6489; Pebble Beach Road, *Mills* sp. 4760, *Nuttall* 67.

3. **STYLOPHYLLUM** Britt. & Rose.

Perennials with more or less branched rootstocks; basal leaves linear, elongated, terete, or flattened but always narrow, sometimes abruptly widened below into a broad clasping base; flowering stems with long sessile leaves not clasping at base. Calyx 5-lobed, the lobes ovate, equal and small. Corolla campanulate, not angled, white, red or yellowish, its lobes broad, thin and spreading, united below into a tube. Stamens 10, borne on the corolla-tube. Carpels 5, united below, generally strongly spreading as in *Sedum*.

Leaves acute, 11-15 cm. long.

Leaves obtuse, 8-10 cm. long.

1. *insulare*.

2. *Hassei*.

1. **S. insulare** Rose. Bull. N. Y. Bot. Gard. 3:34 (1903). Plate VI, f. 1.)

Stems very thick and woody, 6-8 cm. in diameter, crowned by a rosette of spreading leaves, the old leaves somewhat persistent. Leaves 11-15 cm. long, 1-1.5 cm. broad above the base, 2 cm. broad at base, fleshy, much flattened except toward the apex, acute, more or less glaucous especially when young; flowering branch stout, purplish, 3-4 dm. long; inflorescence paniculately branched; primary branches short, nearly equal, two or three times dichotomous, the ultimate branches short and few flowered; calyx 3 mm. long, its lobes twice as long as the tube, ovate, acute; corolla 7 mm. long, reddish, somewhat campanulate, its tube about the length of the carpels; carpels united at base, widely spreading.

Dry cliffs and break-offs near the sea. May to July. *Trask*, June 10, 1902, type in U. S. Nat'l Herb., fragm. in herb. Field. Reported by *Mrs. Trask* as *Cotyledon lanceolatum*.

2. **S. Hassei** Rose *ibid.* 35.

Caudex elongated, sometimes about 3 dm. long, 2-3 cm. in diameter, somewhat branching, covered with the old persistent leaves, crowned with a dense erect rosette. Leaves very glaucous, linear, not tapering

except toward the apex, 10 cm. long or less, 1 cm. wide or less, thick but flattened below, terete and obtuse toward apex; flowering stems weak, their primary branches 1-2-dichotomous, the ultimate branches slender and many flowered; calyx small, glaucous, 4 mm. long, cleft to or below the middle, its lobes ovate, acute; corolla-tube about 1 mm. long; carpels widely spreading in age.

Beach cliffs. May to June. *Trask; Hasse*, May 30, 1902, type in U. S. Nat'l Herb., co-type Herb. N. Y. Bot. Gard. and Herb. Field.

Family 2. **SAXIFRAGACEÆ.**

SAXIFRAGE FAMILY

Annual or perennial, caulescent or acaulescent herbs. Leaves alternate or sometimes opposite, commonly all basal, rarely stipulate; blades simple and entire, toothed, lobed or divided, the teeth often pore-bearing. Flowers perfect, borne in simple or compound open or congested cymes or racemes, usually terminating the main stem, or lateral branches which arise from the axils of the leaves near the apex of the rootstock. Hypanthium usually well-developed, flat, turbinate, campanulate or cylindric, more or less adnate to the base of the gynoecium. Calyx of 5, or rarely 4 or more sepals. Corolla of as many distinct petals as there are sepals, or wanting. Androecium of as many or twice as many stamens as there are sepals, borne on the edge or on the inner surface of the hypanthium; filaments subulate to clavate. Gynoecium of 2 or rarely 3 or 4 carpels, wholly or partially united or rarely distinct, the placentae parietal, axial or basal. Ovary partially or wholly inferior. Fruit a capsule or follicle. Seeds with fleshy endosperm.

Placentae parietal, flowers racemose.
Placentae axial, flowers cymose.

1. **LITHOPHRAGMA.**
2. **JEPSONIA.**

1. **LITHOPHRAGMA** Nutt.

Perennial herbs with slender bulblet-bearing rootstocks and axial leafy flowering shoots. Hypanthium from campanulate or hemispheric and adnate only to the base of the gynoecium to elongated-turbinate and adnate to the lower half of the gynoecium. Sepals 5, valvate in aestivation, rounded to triangular. Petals white or rose-colored, clawed, digitately or pinnately divided, toothed or entire, much exceeding the sepals. Stamens 10, included; filaments short; anthers cordate. Gynoecium 1-celled with 3 parietal placentae, 3-valved at the apex; styles 3, short. Seeds many, horizontal.

1. *L. catalineæ* Rydb. N. A. Flora 22:88 (1905).

Stem about 3 dm. high, sparingly glandular-pubescent; petioles of basal leaves about 5 cm. long, more or less glandular-hairy; blades reniform, 3-4.5 cm. wide, sparingly pubescent, thin, indistinctly 3-5-lobed and crenate with very broad rounded or truncate teeth; stem-leaves with short petioles, which are more or less dilated, and broad fimbriate stipules; blades deeply 3-cleft with broadly oval, crenate divisions; hypanthium broadly obconic, 3-3.5 mm. broad, 2.5-3 mm. high, or with the sepals about 4 mm. high; sepals triangular; petals 7-8 mm. long; blades usually 3-cleft, with rather short, very acute lateral lobes.

On moist rich canyon sides and bottoms in shade. March to May. *Trask*; *Brandegee* (as *Tellima affinis*); Silver Canyon, *Millsp.* 4880; Descanso and Golf Links Canyons, *Nuttall* 177, 596.

2. *JEPSONIA* Small.

Perennial acaulescent herbs, with bulb-like rootstocks supporting a short caudex and several slender autumnal scapes. Leaves alternate, all basal, vernal; blades about as broad as long, shallowly lobed and toothed, cordate at the base, petioled. Flowers in terminal cymes. Hypanthium with a flat base. Sepals 5, partially united into a campanulate, somewhat corolloid, veiny tube which surmounts the hypanthium. Corolla white or nearly so, regular. Petals 5, of a spatulate type, withering-persistent, the claws partially adnate to the calyx-tube. Filaments adnate to the calyx-tube, but not as high up as the petals. Ovary superior, the 2 carpels united to about the middle. Follicles veiny, the bodies filling the calyx-tube, the slender beaks diverging at a right angle. Seeds prominently 4-ridged.

1. *J. neonuttalliana* Millsp. *sp. nov.*

Caudex subterra e bulbo ovato 2.5x1.5 cm; foliis omnibus radicalibus; petiolo longo tenuique; lamina orbiculato-cordata acriter sed non profunde in 5 lobos incisa, supra et ad venas infra pilosa; margine irregulariter acriterque serrato; scapis filiformibus, summa paniculato-racemosi, ramis plerumque 3-floris, floribus 5-7 mm. latis; calyce leviter campanulato, glanduloso-hispido, crasso, 10 lineis purpureo-lineato; lobis brevibus, obtusis; petalis albis rubro-venatis, obtusis, spathulatis, infra breviter attenuatis, in limbo calycis sub lobos insertis; filamentis longitudine parce antheris aequalibus; carpellis pyriformibus, supra divergentibus, ad basim unitis, rostro longo tenuique; stigmatibus capitatis, bilabiatis. Near *J. Parryi* but much taller and distinct in all floral characters. I take pleasure in dedicating this species to Mr. L. W. Nuttall, its discoverer, who spent nearly a year in comprehensive field work on the island.

On open, bare ground, on the interior side of the ridge extending inward from Lookout Point, Pebble Beach, November 27, 1920, *Nuttall 931*. Also seen on the bare plateau half way up the Equestrian Trail and in a hollow on the eastern slope of Avalon Valley opposite the Saw Mill.

Family 3. GROSSULARIACEÆ.

CURRENT FAMILY.

Shrubs, with often fascicled usually lobed petioled leaves, and racemose or subsolitary axillary or lateral flowers, the pedicels bracteolate. Calyx-tube adnate to the ovary, the limb 4-5-lobed, often colored. Petals 4 or 5, inserted on the throat of the calyx, small, scale-like, often included. Stamens 4 or 5, inserted with the petals. Ovary 1-celled; styles 2, distinct or united. Berry globose or ovoid, pulpy, the calyx persistent on its summit. Seeds obscurely angled, their outer coat gelatinous, the inner crustaceous.

1. RIBES Linn.

Characters of the family as described above.

1. *R. viburnifolium* A. Gr. Proc. Am. Acad. 17:202 (1882).

Evergreen, unarmed; branches straggling; young twigs resinous-glandular. Leaves thick, dark-green above, pale-green and resinous-dotted beneath, ovate to obovate-oval, 2-7 cm. long, obtuse at the apex, narrowed or rounded at the base, sparingly repand-dentate or nearly entire-margined, glabrous or somewhat pubescent when young; petioles rather stout, shorter than the blades, mostly not more than 1 cm. long, pubescent or glabrous; racemes 1 to 3 from the same bud, few-several-flowered, as long as the leaves or shorter, resinous-glandular; pedicels filiform, 5-10 mm. long; bracts narrowly lanceolate, acute, mostly shorter than the pedicels, caducous; hypanthium turbinate; sepals oval, rose-colored, spreading; petals greenish, very small; berry subglobose, about 6 mm. in diameter.

Moist hillside thickets. February to April. *Lyon*; *Mrs. Trask* says "It covers the steep walls of one canyon to the height of a hundred feet and extends in a mass for a quarter of a mile. It festoons the overhanging rocks mile after mile of this canyon which should be called 'Currant Canyon'"—she does not, however, locate the canyon; near Avalon, *Miss Merritt*; *McClatchie*, *Grant & Wheeler*, *Walpole*; *Gallagher's Canyon*, *Brandegce*, *Eastwood 6467*, *Jepson 3055*; *Equestrian Trail*, *Millsp. 4654*; *Bannings Canyon*, *Nuttall 329*; *Pebble Beach Canyon*, *Nuttall 1163*, *Knopf 249*; *Silver Canyon* and near *Howland's*, *Knopf 279*, *275*; *Bulrush Canyon*, *Knopf 355*. Transplanted to the grounds of the Banning House at the Isthmus from roots brought from the west end; (*Millsp. 4624*), the gardner says that it "grows finely in cultivation so long as it is not pruned—pruning kills it." CATALINA PERFUME, BAOBAB, WILD CURRANT.

Family 4. **CUNONIACEÆ.**

CUNONIA FAMILY.

Shrubs or trees. Leaves opposite or rarely ternate or verticillate, stipulate, simple or compound. Inflorescence various. Flowers small, mostly perfect, sometimes polygamous or dioecious. Hypanthium with a hypogynous or perigynous disk within. Sepals 4 or 5. Petals 4 or 5, usually not larger than the sepals. Stamens as many as the petals, twice as many, or sometimes more, inserted under the margin of the disk; filaments slender, longer than the petals or equaling them; anthers short, 2-celled. Carpels usually 2, united into a 2-celled ovary, or distinct; ovules usually numerous and in 2 rows on the placenta. Fruit mostly capsular or follicular. Seeds several or numerous, often winged; embryo small; endosperm present; cotyledons flat or convex.

1. **LYONOTHAMNUS** A. Gray.

A tree or shrub, the bark exfoliating in narrow strips. Leaves persistent, petioled, lanceolate, entire, crenate, aspleniform, or compound with linear-lanceolate aspleniform segments; stipules small, lanceolate or linear, deciduous. Flowers perfect in large terminal compound cymes. Bracts minute, persistent; pedicels very short. Hypanthium campanulate, bearing 1-3 minute bractlets. Sepals 5, triangular-ovate, persistent. Disk woolly, slightly 10-lobed. Petals 5, white, nearly orbicular, not clawed, deciduous. Stamens 15, in pairs opposite the petals and singly opposite the sepals; filaments subulate; anthers oblong, introrse, the sacs longitudinally dehiscent. Pistils 2, distinct; ovary ovoid, glandular; style stout, outwardly curved; stigma subcapitate. Ovules 4 in each ovary, oblong, anatropous, suspended. Fruit of 2 small woody follicles, usually 4-seeded. Seeds oblong, pointed, with little endosperm and a membranous testa; cotyledons oblong, much longer than the straight radicle; hilum orbicular; raphe winged.

1. **L. floribundus** A. Gray, Proc. Am. Acad. 20:292 (1885). Plate VII.

Lyonothamnus asplenifolius Greene, Bull. Calif. Acad. 1:187 (1886).

Lyonothamnus floribundus asplenifolius Brand. Zoc. 1:136 (1890).

A tree, 14 m. high or less, the trunk sometimes 3.3 dm. in

diameter, usually smaller, sometimes a mere shrub; bark reddish-brown, its strips remaining long attached to the trunk; young twigs pubescent, becoming orange-red and glabrous; leaves 2 dm. long or less, thick, densely white-tomentose beneath when young, becoming glabrous, or somewhat pubescent beneath when old, dark-green above, paler on the under side, varying greatly from quite simple and entire to deeply many-lobed and compound, the lobes close together, oblique, acute; cymes 1-2.5 dm. broad, densely many-flowered, pubescent; pedicels 2-3 mm. long; hypanthium tomentose, 2-3 mm. in diameter; petals 2-3 mm. broad; follicles rough-glandular, 2.5-3 mm. long.

Forming groves on canyon sides, at altitudes from 500-1500 ft., facing northerly, June. This unique tree was first found on Catalina by *Dr. Gustav Eisen* in 1874. In 1884 Mr. William S. Lyon sent some specimens, collected at the Isthmus (*Nevin & Lyon*), to Dr. Gray who recognized it as a new genus and named it in his honor. *Lyon* re-collected it, at the same place, in 1885, as his number 75; both these collections are in Herb. Gray—Harvard. This type grove grows three-quarters of the way up the first gulley south of the Banning House and consists of about 50 trees (*Mills* 4792; *Nuttall* 642, 714). *Mrs. Trask*, who distributed many specimens to various herbaria, remarks that the tree is not nearly so rare as was first supposed and claims that beyond the Isthmus it is found here and there everywhere. There are several groves on the north faces of the upper slopes at Banning's Canyon (*Pollay*; *Nuttall* 788; *Knopf* 120); Gallagher's Canyon (*Mrs. Miller*; *Brandeggee*; *Jepson* 3045; *Hall* 8277-8; *Nuttall* 845); and the upper reaches of Swain's Canyon (*Smith* 5174; *Knopf* 50, 92, 216).

This tree is peculiar to the larger islands of the Channel Group where it grows in gullies on rocky slopes as described above. On the outer islands, the leaves are mostly cut into fern-like form, though on Catalina this form seldom occurs. On Catalina the largest trees are in the neighborhood of 60 feet high, and often reach over a foot in diameter of trunk. The bark shreds off in stringy pieces while the wood is pinkish in color and very heavy, hard and close grained. On this account it was used by the natives for spear handles and shaft wood, and later by the whites for fishing rods, canes, and similar articles.

IRONWOOD.

Family 5. CROSSOSOMATACEÆ.

CROSSOSOMA FAMILY.

Shrubs or small trees, with rough bitter bark. Leaves alternate, often approximate on short branches or clustered on spurs; blades simple, leathery, entire. Flowers perfect, solitary at the ends of short branches. Hypanthium turbinate. Calyx of 5 persistent sepals. Corolla of 5 white or purplish deciduous petals. Androecium of many stamens, usually 15 or more; anthers oblong to oval. Gynoecium of 3-5 stipitate ultimately distinct carpels borne in the base of the hypanthium. Ovary elongate; styles short, at least during anthesis, or obsolete; stigmas depressed. Ovules several or many, borne in 2 rows. Fruit a cluster of 2-5 follicles. Seeds globular to reniform, each enclosed in a fimbriate aril. Endosperm thin, fleshy.

1. CROSSOSOMA Nutt.

Stems usually much-branched. Leaf-blades pinnately-veined,

sessile or nearly so. Flowers pedicelled. Sepals very broad, usually suborbicular, concave. Petals spatulate or orbicular-obovate. Stamens usually borne in 2 rows. Carpels erect; style short or obsolete; stigma minute. Follicles spreading or recurved. Seeds often adherent in a body by means of the aril-fringe.

1. *C. californicum* Nutt. Jour. Acad. Phila. 2, 1: 150 (1848).

Shrub or small tree, with a rough somewhat flaky bark; leaf-blades oblong, oblong-obovate, spatulate or linear-spatulate, 2.5-9 cm. long, commonly mucronate, sessile, or nearly so; flowers long-pedicelled; hypanthium 4.5-5.5 mm. broad at maturity; sepals suborbicular, 8-12 mm. long; petals white, broadly obovate to oblong-obovate, 14-18 mm. long; follicles drooping, 15-32 mm. long, the bodies cylindric, wrinkled, each terminating in a curved or hooked beak; seeds about 3 mm. in diameter.

Growing to a height of 3 meters or more and with a trunk up to 15 cm. in diameter on the moist wooded hillsides and in canyons. December to July, Gambel (who collected the type of this species on Catalina); Dall & Baker; Lyon & Nevin; Trask 216 (herb. N. Y.); Miss McClatchie; Davidson 5715; Grant 1511; Grant & Wheeler 2351, 6149; Eastwood 6503; Babcock; Brandegee; Wallace; Parish 10758; Smith 4990; Moxley 723; Nuttall 1; Millsp. 4480, 4515, 4916. WILD APPLE (from the general appearance of the tree when in flower).

Family 6. ROSACEÆ.

ROSE FAMILY

Herbs, shrubs, or trees, with alternate leaves, usually evident stipules, perigynous mostly numerous stamens, distinct free pistils from one to many, or in one suborder few and coherent with each other and with the calyx-tube into a 2-several-celled inferior ovary, and anatropous few or solitary seeds destitute of albumen or nearly so: these are the characters of this great order. But the stipules are sometimes evident only upon vigorous shoots, and rarely fail altogether, the stamens are sometimes even fewer than the petals or lobes of the calyx, and in a few cases the albumen of the seed is somewhat copious.

Herbs:

Petals present.

Petals absent.

Shrubs:

Without prickles:

Flowers in terminal racemes:

Leaves alternate, toothed.

Leaves fascicled, entire.

Flowers solitary or somewhat fascicled.

Prickly shrubs:

Fruit a cluster of drupelets.

Fruit single fleshy enclosing the achenes.

2. *DRYMOCALLIS*.

3. *APHANES*.

1. *SERICOTHECA*.

4. *ADENOSTOMA*.

5. *CERCOCARPUS*.

6. *RUBUS*.

7. *ROSA*.

1. **SERICOTHECA** Raf.

Unarmed shrubs with simple toothed or lobed exstipulate deciduous leaves and terminal panicles of numerous white flowers. Calyx deeply 5-cleft, nearly rotate. Petals 5, rounded. Stamens 20, inserted on an annular perigynous disk. Pistils 5, distinct, becoming 1-seeded hairy carpels, tardily dehiscent by the dorsal suture or indehiscent.

1. **S. franciscana** Rydb. N. A. Flora 22:262 (1908).

Schisonotus ariaefolius Greene, Fl. Fran. 58 pt. (1891).

Holodiscus ariaefolius Greene, Man. Bay Reg. 113 pt. (1894).

Shrub 1-4 m. high; the branches short, rigid; bark grayish brown, more or less shreddy; leaves ovate, 3-6 cm. long, cuneately narrowed to a short winged petiole, pinnately lobed or toothed above the middle, green and nearly glabrous above, whitish tomentose beneath; panicles erect, branching; carpels hirsute.

Shrubby canyon slopes. July to Sept. *Trask*, "Found in but one canyon"; *McClatchie*; Gallagher's Canyon, *Eastwood* 6464 (as *Spiraea ariaefolia*); *Banning's* Canyon, left fork, *Nuttall* 669. SPIRAEA.

2. **DRYMOCALLIS** Fourr.

Erect more or less glandular or viscid herbs from perennial rootstocks, with pinnate leaves and cymose yellow 5-merous bracteolate flowers. Calyx saucer-shaped or hemispheric. Petals obovate, elliptic or nearly orbicular, obtuse. Stamens 20-30 on a persistent disk at base of receptacle. Receptacle hemispheric with numerous pistils which become dry achenes. Style basal, slightly thickened and glandular below, tapering at both ends or nearly filiform, rather persistent. Seed attached near the base, ascending, orthotropous.

1. **D. glandulosa** (Lindl.) Rydb. Mem. Bot. Columb. Univ. 2:198 (1898).

Potentilla glandulosa Lindl. Bot. Reg. 19: pl. 1583 (1833).

Stem strict, 3-6 dm. high, indistinctly striate, viscid and glandular-hairy, especially upward, subsimple below, irregularly branched above; lower stipules lanceolate, the upper ovate, acuminate, and usually deeply toothed; basal leaves with petioles 2-10 cm. long, pinnate, sometimes interruptedly so; leaflets 7-9 sparingly hairy, nearly glabrous on the upper surface, obovate, generally obtuse, simply or doubly serrate with broad teeth, the upper usually a little larger, 1-3 cm. long; stem-leaves smaller, short-petioled, 3-7-foliate; flowers in an open many flowered cyme, 10-15 mm. in diameter; hypanthium glandular-hirsute, in fruit 6-7 mm. broad; bractlets linear-lanceolate, 4-5 mm. long, much shorter than the oblong or ovate-lanceolate, gradually acuminate or acute sepals, which are 6-7 mm. or in fruit about 1 cm. long; petals

obovate, about equaling the sepals; stamens 20-25; pistils many; styles fusiform.

So far collected only by *Dr. Davidson*. Shaded by oaks in a ravine branch of Avalon Canyon, in late August, 1893.

3. APHANES Linn.

Small annual herbs. Leaves short-petioled or subsessile; stipules connate and adnate to the petioles or leaf-blades, few-toothed; blades deeply digitately 3-parted and again toothed and lobed. Inflorescence forming small axillary clusters. Hypanthium ellipsoid-urceolate, contracted at the mouth. Disk poorly developed. Sepals usually 5, rarely 4, subtended by as many or fewer small bractlets, which, however, occasionally are lacking. Petals none. Stamens usually solitary, rarely 2-5, inserted opposite one or more sepals, but sometimes by shifting, inserted almost between them; filaments short; anthers introrse. Pistils 1-4, usually 2. styles slender, basal; stigmas capitate.

1. *A. cuneifolia* (Nutt.) Rydb. N. A. Flora 22:380 (1908).

Alchemilla cuneifolia Nutt. T. & Gr. Fl. N. A. 1:432 (1840).

Alchemilla arvensis of Brewer & Wats. Bot. Calif. 1:185 (1876)
non Scop.

Low slender annual; stem often simple or somewhat branched, ascending or erect, 2-10 cm. high, rather sparingly pubescent with ascending hairs; stipules less than 5 mm. long, connate, with 2-4 ovate teeth; lower leaf-blades short-petioled, the upper sessile, 2-8 mm. long, cuneate, sparingly pubescent, 3-cleft about halfway down, their divisions with 2-4 ovate teeth; hypanthium nearly 1 mm. long, urceolate, pubescent with short, spreading hairs or glabrous; bractlets minute or often wanting; sepals ovate, about one-third as long as the hypanthium; achenes usually solitary.

Shady places in canyons. July. Near the west end of the island, *Lyon 39* (included in *Brandege* list). LADY'S MANTLE. This is the only specimen of the species so far found on the island.

4. ADENOSTOMA H. & A.

Shrubs with fascicled or alternate, rigid, filiform or clavate leaves. Inflorescence paniculate with short spike-like branches. Hypanthium urceolate or obconic, 10-angled, in fruit enclosing the single achene, often with 5 glands in the throat alternate with the sepals. Sepals 5, rounded, mucronate. Petals 5, orbicular, spreading. Stamens 10-15, 2 or 3 opposite each sepal; anthers sub-globose. Pistils solitary; ovary obliquely obovoid, covered at the top by a hairy cushion; style lateral,

inserted under the edge of the cushion; twice bent; stigma capitate; ovules solitary; pendulous.

1. **A. fasciculatum** H. & A. Bot. Beech. Voy. 139 (1832). Plate V, f. 2.

A diffusely branched shrub, 0.5-6 m. high; bark of the twigs reddish, glabrous or slightly puberulent, that of the older branches gray and becoming shreddy; leaves fascicled, filiform-clavate, short-petioled, usually somewhat curved, acute, shining, glabrous, 5-10 mm. long, thick, channeled on one side; bracts and bractlets lanceolate, callous-spinose-tipped; hypanthium obconic, 2 mm. long, strongly striately 10-angled; sepals semi-obicular, mucronate, spreading; petals white, orbicular, scarcely 1.5 mm. long; filaments filiform, about equaling the petals.

In extensive groves principally on the northerly slopes of canyons at from 200-800 feet altitude. April to October, but full blooming in June. Frequently seen with a trunk a foot in diameter and a height of twenty-five feet. *Lyon 53; Trask; Brandegee*; canyon south of Avalon, *Pendleton 1385*; Cherry Canyon, *Smith 5097, Knopf 173*; a whole hillside, at Fourth o' July, with only one branch in bloom in March, *Mills. 4794*; near the top of the Equestrian Trail, *Nuttall 159*; high ridge trail from White's Landing to Echo Lake, *Knopf 102*; at the Isthmus, *Eastwood 6506*. GREASEWOOD.

The roots are always swollen into bulb or tuber-like masses which are largely sought for as firewood, in fact, they furnish the principal domestic fuel on the island. They burn slowly, at first, but finally yield lasting hot coals.

5. **CERCOCARPUS** H. B. K.

Shrubs or trees with hard wood. Leaves alternate, simple, toothed or entire-margined; stipules adnate to the petioles. Flowers axillary, solitary or fasciculate. Hypanthium with a cylindric persistent tube, abruptly widening into a turbinate or campanulate deciduous limb. Sepals 5, from broadly triangular to nearly subulate. Corolla wanting. Stamens 15 or more, inserted at different heights on the limb of the hypanthium; filaments subulate or filiform, distinct; anthers subrotund or broadly elliptic, emarginate at each end, affixed dorsally above the base, dehiscent longitudinally. Pistil solitary, inserted in the bottom of the hypanthium; ovary cylindric-fusiform, sessile; style terminal, elongate, plumose; stigma undivided, terminal. Ovules solitary, basal. Seed cylindric; cotyledons linear.

Leaves coriaceous, veins strong, raised beneath.

1. *Traskiae*.

Leaves not coriaceous, not strongly raised beneath:

Hypanthium and young leaves with spreading hairs. 2. *alnifolius*.

Hypanthium and young leaves silky strigose. 3. *betuloides*.

1. **C. Traskiae** Eastw. Proc. Calif. Acad. 3, 1:136 (1898).

A tree, 3-7.5 m. high, with a trunk 5-25 cm. in diameter; bark

rough, grayish-brown; branches downy-tomentose; petioles stout, about 5 mm. long; leaf-blades orbicular to oval, 2-6 cm. long, 1-5 cm. wide, obtuse or acutish at the apex, subcordate, truncate or rarely cuneate at the base, deeply dentate to nearly entire, glabrous and glossy in age above, densely white-tomentose beneath; lateral veins about 7-8 on each side, very prominent beneath; flowers polygamous, in fascicles of 3-7, pedicelled; tube of the hypanthium about 1 cm. long, densely villous-tomentose; limb open-campanulate, tomentose without, glabrous within, together with the sepals 5-8 mm. broad; sepals broadly triangular; stamens numerous; filaments slender; anthers tomentose, the cells oblong; achenes 1 cm. long, silky-strigose; style in fruit about 5 cm. long.

In a dry arroyo at the Salta Verde. March to June. This rare species, of Mountain Mahogany, has only been collected by *Mrs. Trask*. It grows in a single small "grove" in the locality mentioned above. Specimens are in the herbaria of the Calif Acad. Sci.; Gray; N. Y. Bot. Gard. and Field Museum.

2. **C. alnifolius** Rydb. N. A. Flora 22:421 (1913).

Cercocarpus betulaeifolius *Blancheae* Schneid. Mitt. Deuts. Dendr. Ges. 14:127 (1905).

Tree 5-10 m. high, with a trunk 2-5 dm. in diameter; bark gray, rough, on the older parts much cracked; branches glabrate; petioles about 1 cm. long; leaf-blades rounded-oval, 3-6 cm. long, 2.5-4 cm. wide, sparingly appressed-pubescent when young but glabrate above, somewhat villous-tomentulose beneath, dentate with short and broad teeth; lateral veins 6 or 7 on each side; tube of the hypanthium about 12 mm. long, villous-tomentose; limb hemispheric-campanulate, together with the sepals 6-7 mm. wide, villous-tomentose without, glabrate within; sepals broadly triangular, obtuse; achenes about 12 mm. long, silky; style in fruit 5-6 cm. long, usually strongly curved.

On canyon slopes, February to June. *Trask*; Descanso Canyon, *Parish 10752, Smith 5018*; Cherry Canyon, *Smith 5096*; Avalon Canyon, *Mills 4718*; Pebble Beach Canyon, *Knopf 21*; Middle Ranch Canyon, *Knopf 393*; Bulrush Canyon, *Knopf 352*. MOUNTAIN MAHOGANY, HARD TACK.

2. **C. betuloides** Nutt. T. & Gr. Fl. N. A. 1:427 (June 1840).

Cercocarpus betulaeifolius Nutt. Hook. Ic. Pl. 322. (Oct. 1840).

Cercocarpus parvifolius *glaber* Wats. Bot. Calif. 1:175 (1876).

A tree 3-10 m. high, with smooth bark, separating into scales falling off in the autumn; branches glabrous or nearly so; petioles 2-4 mm. long, appressed-hairy or glabrate; leaf-blades obovate or oval, 1.5-5 cm. long, 1-2.5 cm. wide, crenate-serrate above the middle with short teeth, rounded at the apex, cuneate at the base, sparingly appressed-hairy when young; soon glabrate, dark-green above, paler beneath, comparatively thin; lateral veins 5 or 6 on each side, not very thick beneath; tube of the hypanthium 8-10 mm. long, silky-strigose; limb turbinate, slightly silky to crispid-strigose without, glabrous within, together with the sepals 6 mm. broad; sepals broadly triangular, obtuse; stamens rather numerous; achenes 10-12 mm. long, style in fruit 6-7 cm. long.

Moist canyon sides and bottoms. January to July. The commonest species. *Trask*; *Brandegee*; *Toumey*; Rock Spring Canyon and Pebble Beach Road, *Smith* 5067, 5165, *Pendleton* 1406, *Reed* 2836, *Millsp.* 4705; Descanso Canyon, *Parish* 10752, *Jepson* 2031; Avalon Canyon, *Eastwood* 6485, *Nuttall* 89, 693; Hamilton Canyon, *Nuttall* 692, *Knopf* 152; Isthmus, *Lyon*, *Eastwood* 6504; Chicken John's Canyon, Middle Ranch Canyon, and Bulrush Canyon, *Knopf* 337, 361, 350, 358. This species of MOUNTAIN MAHOGANY sometimes attains a height of 40 feet.

6. RUBUS Linn.

Low shrubs or trailing vines, usually prickly, with alternate leaves, the stipules adnate to the petioles. Flowers terminal or axillary, solitary, racemose or paniced, white or purplish, mostly perfect. Calyx persistent, bractless, deeply 5-parted. Petals 5. Stamens many, inserted on the calyx, distinct. Carpels many, inserted on a convex or elongated receptacle, ripening into drupelets and forming an aggregate fruit. Ovules 2, 1 abortive; style terminal, slender. Seed pendulous.

1. *R. vitifolius* C. & S. *Linnaea* 2: 10 (1827).

Stems climbing over bushes or trailing, biennial, 1-2 m. long, hirsute and with weak, mostly straight prickles, sometimes glabrate the second year; leaves of the shoots 3-foliolate; stipules linear-subulate, about 1 cm. long; petioles, petiolules, and midveins hirsute as well as prickly; petioles 3-4 cm. long; leaflets ovate, acute or short-acuminate at the apex, obtuse or rounded, or rarely subcordate, at the base, sparingly hirsute on both sides, or glabrate in age, sharply double-serrate, green on both sides, 4-8 cm. long; petiolule of the terminal leaflet 1-2 cm. long, those of the lateral ones 1-3 mm. long; leaves of the floral branches ternate or unifoliolate; leaflets of the ternate leaves similar to those of the shoots, but more rhombic-ovate, less acuminate at the apex and often acutish at the base; unifoliolate leaf-blades usually more or less cordate at the base and 3-lobed, with the terminal lobe longer; inflorescence corymbose, terminal, hirsute and weakly prickly; sepals lanceolate, grayish-tomentose on both sides, 8-10 mm. long, caudate-acuminate, rarely with foliaceous tips and then much longer, closing around the fruit; petals of the staminate flowers elliptic, 10-15 mm. long, white, those of the essentially pistillate flowers oval, 5 mm. long; fruit elongate, 8-12 mm. long, 7-8 mm. thick; drupelets numerous, pubescent; putamen slightly reticulate.

Mostly along the streamlets of canyon bottoms. April to June. *Lyon*; *Brandegee* (as *Rubus ursinus*); Avalon Canyon, *Baker* 857, *Heller* 6682, *Smith* 5068, *Eastwood* 6494, *Nuttall* 113, 148; Graveyard Canyon, *Knopf* 134; Bigwash Canyon, *Millsp.* 4598; Bulrush Canyon, *Knopf* 354. BRAMBLE, BLACK-BERRY.

7. ROSA Linn.

Prickly shrubs with odd-pinnate leaves, adnate stipules and large

solitary or corymbose flowers. Calyx-tube globose or urceolate; its limb 5-parted; bractlets none. Petals 5, rounded, spreading. Stamens many on the silky disk, which lines the calyx-tube. Pistils many, included in the calyx-tube, but free and distinct; styles subterminal; ovules solitary, pendulous. Achene bony, enclosed in the fleshy enlarged red berry-like calyx-tube.

1. **R. californica** Cham. & Schl. *Linnaea* 2:35 (1827).

Stem erect, terete, light-brown or yellowish, diffusely branched, 1-3 m. high, usually armed with stout flattened, recurved prickles 5-8 mm. long; young shoots sometimes bristly; floral branches 1-3 dm. long, usually prickly; stipules adnate, narrow or those of the upper leaves dilated, more or less villous, glandular-dentate; petiole and rachis villous, prickly, and sometimes somewhat glandular; petioles 0.5-2 cm. long; leaflets 5-7, rarely 3 or 9, oval, 1-2 cm. long, usually simply serrate, with triangular-lanceolate, not glandular teeth, dull and more or less appressed-pubescent above, villous, but rarely slightly glandular beneath, usually rounded or obtuse at both ends; inflorescence usually corymbiform, leafy-bracted, 1-10-flowered; pedicels short, glabrous or somewhat villous; hypanthium glabrous, globose or subglobose, with a distinct neck, in fruit 10-15 mm. broad; sepals lanceolate, caudate-attenuate, about 15 mm. long, entire, villous and rarely glandular on the margins, tomentose within; petals obcordate, 1.5-2.5 cm. long, rose-colored; styles free, not exerted.

Moister canyon sides and bottoms. May to June. *Lyon; Brandege; Trask; Gallagher's Canyon, Eastwood 6461; Cherry Canyon, Smith 5095; Rock Spring and Pebble Beach Canyons, Nuttall 126, 1159; Graveyard and Hamilton Canyons, Knobf 133, 153.* WILD ROSE.

Family 7. MALACEÆ.

APPLE FAMILY

Trees and shrubs with alternate simple or pinnate leaves, the stipules free from the petiole, small and deciduous. Flowers regular, perfect, racemose, corymbose or solitary. Calyx 5-toothed or 5-lobed, the tube adnate to the ovary. Petals 5, usually clawed. Stamens numerous or rarely few. Ovary 1-5-celled, composed of 1-5 usually united carpels; styles 1-5; ovules 1-2 in each carpel. Fruit a more or less fleshy pome, consisting of the thickened calyx-tube enclosing the bony papery or leathery carpels. Endosperm none; cotyledones fleshy.

1. PHOTINIA Lindl.

A small evergreen tree or sometimes shrubby, with simple coriaceous toothed leaves and terminal corymbose panicles of small white

flowers. Calyx turbinate, 5-parted, the lobes at length inflexed over the carpels and becoming fleshy. Petals rounded, concave. Stamens 10; filaments dilated at base and somewhat connate. Ovary 2-3-celled, 4-6-ovuled; styles 2-3. Fruit a red ovoid berry-like pome; carpels free from the fleshy calyx-tube above the middle.

1. *P. arbutifolia* Lindl. Tr. Linn. Soc. 13:103 (1821).

Heteromeles arbutifolia Roem. Syn. Monogr. 3:105 (1847).

Photinia salicifolia Abrams Bull. N. Y. Bot. Gard. 6:381 (1910).

Usually 3-6 m. high, nascent parts tomentulose; leaves narrowly oblong or oblong-lanceolate, 5-10 cm. long, remotely serrate or dentate, dark green and shining; fruit about 6 mm. long. Fruits brilliant scarlet or orange-yellow.

Moister slopes and canyon bottoms. February to July. Near the Isthmus. Lyon 11; Trask; Brandegee; Avalon Valley, Eastwood 6496, Grant 3754, Smith 4991, Millsp. 4722, Nuttall 147, 974 (berries yellow), Knopf 261 (berries yellow); Golf Links Canyon, Nuttall 83; Big Wash Canyon, Knopf 231; Descanso, Hamilton and Pebble Beach Canyons, Knopf 166, 265, 268, 269; White's Landing, Smith 5173; Banning's Landing, Millsp. 4920; Rock Spring Canyon, Smith 5117; Rock Falls Canyon, Nuttall 691. CALIFORNIA HOLLY, HOLLY; TOYON, TOLLON.

Sometimes found in groves like *Lyonothamnus*. Often nearly 30 feet high with a trunk a foot in diameter. The fruits are generally cleaner and larger than those on the mainland, and often rich orange-yellow instead of bright red. The bark is used by fishermen for tanning nets and sails.

Family 8. AMYGDALACEÆ.

PEACH FAMILY

Trees or shrubs with alternate deciduous or evergreen usually serrate leaves and white or rose-colored flowers in terminal or axillary racemes or corymbs. Calyx campanulate or turbinate, 5-cleft, deciduous. Petals 5, inserted on the calyx, spreading. Stamens 15-25, inserted with the petals. Ovaries 1-5, 1-celled, free; ovules 2, pendulous. Fruit a more or less fleshy drupe with a bony stone; seeds 1 or rarely 2.

1. LAUROCERASUS Reichb.

Trees and shrubs, with alternate coriaceous leaves, persistent into the second season, toothed or entire. Flowers in narrow racemes, arising from the axils of the leaves of the previous season. Calyx with 5 short lobes; petals small, white. Stamens 15-30. Style terminal. Fruit with a large smooth stone and thin scarcely fleshy exocarp.

Leaves spinulose-toothed
Leaves entire-margined

1. *ilicifolia*
2. *Lyoni*

1. *L. ilicifolia* (Nutt.) Roem. Syn. Ros. 5:92 (1847).
Prunus ilicifolia Walp. Rep. 2:10 (1843).

An evergreen tree attaining a height of about 12 m. with a trunk often 6 dm. in diameter, frequently a mere shrub. Leaves ovate, thick, spiny-toothed, about 6 cm. long, acute or blunt, slightly cordate or cuneate at the base, dark green and shining above, dull yellowish-green beneath; petioles channelled, 3-12 mm. long. Racemes as long as the leaves or longer, pedicels 3-6 mm., calyx lobes pointed, reflexed, much shorter than the ovate, blunt petals; stamens about as long as the petals. Fruit globular, purple, about 1.5 cm. diameter; flesh thin; pit ovoid, smooth.

Canyon sides. April to July. The type from near the Isthmus, *Lyon 21* (Herb. Gray; photo. Herb. Field); *Trask* (as *Cerasus ilicifolia*); *Brandegge*; *Gallagher's Canyon, Eastwood 6476*; *Bishop Str. Hollow and Big Wash Canyon, Nuttall 117, 715, 782*. ISLAY. The natives ate the pulp fresh and ground the seeds into meal for porridge.

2. *L. Lyoni* (Eastw.) Britton, Britton & Shafer N. A. Trees 512 (1908).

Cerasus Lyoni Eastw. Handb. Trees Calif. 54 (1905).

Prunus ilicifolia integrifolia Sudw. Gard. & For. 4:51 (1891).

Prunus ilicifolia occidentalis Brand. Proc. Calif. Acad. 2, 1:209 (1888).

Prunus intergifolia Sarg. Man. Trees N. A. 531 (1905) non Walt.

Prunus Lyoni Sarg. Pl. Wilson 74 (1911).

A tree up to 15 m. high with a trunk often 3.3 dm. in diameter. Leaves leathery, ovate to ovate-lanceolate, 5-8 cm. long, pointed, entire margined, dark green and shining above somewhat paler and dull beneath, rounded at the base. Flowering racemes very dense, cylindric, about as long as the leaves; pedicels very short or wanting. Fruit orbicular, purple, 1.5-2 cm. diameter.

Rich, moist, open canyons where it frequently forms extensive groves. March to June. *Lyon & Nevin* (as *Prunus occidentalis*); *Trask*; *Gallagher's Canyon, Brandegge, Eastwood 6476, Jepson 3044, 3059*; *Wishbone, Smith 5017, Nuttall 283*; *Pebble Beach Canyon, Nuttall 743, Knopf 174*; *Descanso Canyon, Nuttall 179, 182, Knopf 117, 207*; *Cherry Canyon, Smith 5119*, *Cherry Valley* where there is a very extensive grove occupying most of the valley and making a beautiful display of trees, *Millsp. 4827*. This is probably the type station. CATALINA CHERRY, ISLAND ISLAY.

The pulp of this species, though scanty, formed one of the fresh fruit foods of the Indians. The cherries are now sometimes preserved whole by Catalinians; the preserve has a slight, pleasant "Wild Cherry" taste.

Family 9. FABACEÆ.

PEA FAMILY

Herbs, shrubs, vines or trees, with alternate mostly compound stipulate leaves, and irregular (papilionaceous) perfect or sometimes polygamo-dioecious flowers, mainly in spikes, heads, racemes or pan-

icles. Calyx 4-5-toothed, or 4-5-cleft, sometimes 2-lipped. Petals more or less united, or separate, perigynous or hypogynous, usually consisting of a broad upper one (standard, banner), two lateral ones (wings), and two front ones more or less united (forming the keel); the standard enclosing the wings in the bud. Stamens monadelphous, diadelphous or sometimes separate, 10 in most of the genera, sometimes 9, rarely 5. Pistil simple, superior; ovary mainly 1-celled, sometimes 2-celled by the intrusion of the sutures, or several-celled by cross-partitions; style simple; ovules 1-many, anatropous or amphitropous. Fruit a legume, 1-many-seeded, dehiscent into 2 valves, or indehiscent, in one tribe a loment. Seeds mostly without endosperm; cotyledons thick.

- | | |
|--|---------------------|
| Leaves palmately 5-11-foliolate | 1. LUPINUS |
| Leaves 3-foliolate: | |
| Shrubs | 2. CYTISUS |
| Herbs: | |
| Flowers in axillary racemes or spikes: | |
| Pods spirally coiled. | 3. MEDICAGO. |
| Pods not coiled but wrinkled | 4. MELILOTUS |
| Flowers capitate | 5. TRIFOLIUM |
| Leaves unequally pinnate, without tendrils: | |
| Flowers in spikes or racemes: | |
| Pods leathery, seeds filling the cavity | 6. HESPERASTRAGALUS |
| Pods papery, seeds far smaller than the cavity | 7. PHACA |
| Flowers solitary or umbellate: | |
| Pods dehiscent | 8. HOSACKIA |
| Pods indehiscent. | 9. SYRMATIMUM. |
| Leaves pinnate, with tendrils: | |
| Style villous all around apex | 10. VICIA |
| Style villous one side only. | 11. LATHYRUS. |

1. LUPINUS Linn.

Herbs, rarely shrubs, with digitately-compound 7-15-foliolate (rarely simple or 3-5-foliolate) leaves, and showy flowers in terminal spikes or racemes. Calyx deeply toothed and 2-lipped. Standard orbicular or ovate, its margins reflexed; wings oblong or obovate; keel incurved, sometimes beaked. Stamens monadelphous, their sheath not cleft; anthers of two forms as in *Crotalaria*. Ovary sessile; style incurved; pod flattened, generally constricted between the seeds, the valves coriaceous.

Annuals:

- | | |
|--|------------------|
| Flowers not verticillate: | |
| Herbage sparsely pubescent, finally glabrous | 1. truncatus |
| Herbage densely villous or pilose: | |
| Keel naked: | |
| Leaflets short, broad obovate | 2. concinnus |
| Leaflets long, narrow obovate | 3. gracilis |
| Herbage hispid with stinging hairs | 4. hirsutissimus |

- Flowers verticillate:
 Keel ciliate, petals 4 mm. long
 Keel naked, petals 10-12 mm. long
 Perennials, shrubby:
 Keel ciliate
5. *micranthus*
 6. *affinis*
 7. *Hallii*

1. *L. truncatus* Nutt. T. & Gr. Fl. 1:373 (1840).

Pubescent with appressed hairs, at length almost glabrous. Leaflets rather succulent, long and narrow, 5-7, linear, attenuate at the base, truncate or somewhat 3-toothed at the apex; stipules minute, linear, short; raceme elongated, the flowers alternate, deep purple, small; the vexillum shorter than the wings; bracts shorter than the pedicels, subulate, persistent; calyx bracteolate, the upper lip 2-parted, the lower minutely 3-toothed or entire; legume hirsute, elongated, 6-7-seeded. Seeds oval-lenticular, all irregularly mottled with white, yellow, and brown, 2.5 x 3.5 mm.

Sandy places and in silt. March to June. *Trask*; *Brandege*; Avalon Valley, *Smith* 4983, *Hall* 8287, *Millsp.* 4737, 4840, *Nuttall* 132; Big Wash Arroya, *Nuttall* 637, 680; Schoolhouse Ridge, *Nuttall* 15; Pebble Beach Canyon, *Knopf* 58, 359; Moonstone Beach, *Knopf* 390.

2. *L. concinnus* Agardh. Syn. Gen. Lupin. 6 (1835).

Plant 10-15 cm. high, densely clothed with very long hairs; those of the leaves equal to the width of the leaflets themselves. Flowers violet, with a yellow spot on the vexillum. Small, very densely villous with soft whitish hairs; leaves mostly radical; leaflets spatulate; stipules subulate-setaceous; flowers a little alternate, in a close ovate spike, on very short pedicels; bracts linear-subulate, shorter than the mostly ebracteolate calyx; the upper lip 2-cleft, the lower entire or 3-denticulate.

In dry washes. June to July. *Brandege*; *McClatchie*. These are the only returns of this species from the island to date.

3. *L. gracilis* Nutt. Jour. Phila. Acad. 7:115 (1834) non Agardh. (1835).

Lupinus Agardhianus Heller, Muhl. 7:13 (1911).

Plant 10-15 cm. high, small, diffuse, very hairy; leaflets 8-10 mm. in length, hirsute, many times shorter than the petioles, minute, obovate-cuneiform canaliculate; peduncle short; flowers 7-10, at length rather remote, on short pedicels, few, alternately disposed along the very flexuous rachis; corolla blue and white, the wings longer than the vexillum; bracts setaceous, persistent, longer than the pedicels; calyx bracteolate; the upper lip 2-parted, the lower somewhat 3-toothed; legumes hirsute, about 5-seeded. Seeds yellowish, irregularly black-maculate, quadrangulo-lenticular, about 2.25 mm. in diameter.

On open, barren ridges. April to May. Reservoir ridge, Avalon, *Millsp.* 1009; Schoolhouse Ridge, *Nuttall* 36, 1156, *Knopf* 572; Snake Canyon, *Nuttall* 261; Salta Verde, *Knopf* 346.

4. *L. hirsutissimus* Benth. Tr. Hort. Soc. n. s. 1, 1:411 (1835).

Stem leafy, branching, very hirsute with bristly hairs, low, nearly erect; leaflets obovate-cuneiform, mucronulate; stipules subulate; flowers reddish-purple, mostly alternate, on short pedicels; bracts subulate, about the length of the calyx; bracteoles caducous; lips of the calyx nearly equal; the upper one deeply 2-cleft, the lower entire.

Arroyas and stony banks. March to May. *Trask*: "Up to three feet high, with pods 2 inches long"; *Brandege*; Avalon Valley in the Arroya of Rock Spring Canyon, *Smith* 4978, *Nuttall* 128, *Millsp.*, *Knopf* 214; Pebble Beach Canyon, *Nuttall* 204; *Howland's*, *Millsp.* 4817; Moonstone Beach, *Knopf* 391. STINGING LUPINE.

5. *L. micranthus* Dougl. Lindl. Bot. Reg. t. 1251 (1829).

Rather slender and weak, branched from the base, 12-20 cm. high, pilose-pubescent, not at all succulent; leaflets 5-7, narrowly linear to linear-spatulate, 1-3 cm. long; petioles twice as long; racemes pedunculate; verticils 3-5, often indistinct; pedicels 3 mm. long or in fruit 6 mm. long; upper calyx-lip 2-cleft, the lobes divergent, lower longer, entire; petals 4 mm. long, blue except the white and dotted middle of the erect mucronulate standard; keel woolly-ciliate above the middle; pods 5-seeded. Seeds whitish-yellow, irregularly elongate-maculate, 3 mm. diameter.

Open, arid situations. March to May. *Brandege*; Big Wash Canyon, *Millsp.* 4852; Golf Links and Schoolhouse Ridge, *Nuttall* 169, 9, *Knopf* 319.

6. *L. affinis* Agardh. Syn. Gen. Lupin. 20 (1835).

Stout and succulent, branching above, 3-6 dm. high, nearly glabrous or somewhat short pubescent; leaflets 7, cuneate-obovate, obtuse or emarginate, 2.5-4 cm. long; petioles 2 or 3 times as long; racemes with 3-7 whorls; bracts equaling the calyx; upper calyx-lip bifid, lower entire or 3-toothed; petals 10-12 mm. long, bluish-purple; keel broad, naked. Seeds reddish, oblong-lenticular, rather plump, dimpled on one side, 5 x 4 mm., a dark ring around the hylum.

Open ridges, canyon slopes and wash bottoms. February to May. *Trask* (labelled *carnulosus* in herb. N. Y.); Maiden Point and Descanso Canyon, *Millsp.* 4640, 4526, *Smith* 5035, *Nuttall* 192; top of the ridge southwest of Avalon, *Nuttall* 319; White's Valley, *Knopf* 57. The plant has much the appearance of *L. hirsutissimus* without hairs.

7. *L. Hallii* Abrams Bull. Torr. Club, 37:151 (1910). Plate XI, f. 2.

Shrubby, 6-10 dm. high, canescent throughout with a short silky pubescence; leaflets 7-9, spatulate, 12-24 mm. long; flowers in whorls 2-3 cm. distant; bracts ovate-lanceolate, acuminate, caducous, 7 mm. long; upper calyx-lobe 2-lobed, the lower 3-toothed; keel conspicuously ciliate on the central part of the inner margin; seeds quadro-ovoid, flatly lenticular, finely brown-maculate, 4 mm. diameter.

Abundant on westerly facing canyon slopes. January to June. *Trask* (labelled in herb. N. Y. *L. albifrons* Bth. = *longifolius* (Wats.) Abrams?)

Brandegee (as *L. Chamissonis*); Gallagher's Canyon, *Eastwood* 6472; *Rusby*; *Macbride & Payson* 834; slopes of Descanso Canyon where it is prevalent, its rounded clumps appearing, in the distance, like sheep, *Moxley* 747, *Mills* 4524, *Smith* 5015, *Nuttall* 183, 212, 677, *Knopf* 35, 130; Schoolhouse Ridge and Avalon Valley, *Nuttall* 26, 138. GIANT LUPINE.

This large blue lupine with its silvery, clump growth, has been generally considered by collectors to be *Lupinus Chamissonis* or *L. albifrons* neither of which species has so far been collected on the island. *L. Chamissonis* is a sea-strand, dune plant, which may yet be found on Catalina.

2. CYTISUS Linn.

Shrubs, with 3-foliolate or 1-foliolate leaves, and showy, clustered flowers, mainly in terminal racemes. Calyx 2-lipped, the teeth short; standard ovate or orbicular; wings oblong or obovate; keel straight or curved; anthers alternately larger and smaller; ovary sessile, many-ovuled; style incurved; pod flat, oblong or linear, several-seeded; seeds strophiolate.

1. *C. canariensis* Steud. Nom. ed. 1, 259 (1821).

Much branched, 1-2 m. high, soft pubescent, leafy; leaflets 6-12 mm. long; flowers yellow, 15-20 mm. long, fragrant, in terminal racemes; upper calyx-lip deeply 3-toothed, the lower slightly so.

In gravelly soil along the upper Pebble Beach Road. April 6, 1921. *Knopf* 69. BROOM.

This is doubtless a transplanted shrub from the mainland, but, as it has proved to escape there and become established, it may yet do so on the island.

3. MEDICAGO Linn.

Herbs, with 3-foliolate leaves, and small yellow or violet flowers in axillary heads or racemes. Leaflets commonly dentate, the veins terminating in the teeth. Calyx-teeth short, nearly equal; standard obovate or oblong; wings oblong; keel obtuse; stamens diadelphous, the 1 opposite the standard separate from the other 9; anthers all alike; ovary 1-several-ovuled; style subulate; pod curved or spirally twisted, reticulated or spiny, indehiscent, 1-few seeded.

Flowers purple, pods coiled but unarmed

Flowers yellow, pods coiled and hook-prickled

1. *sativa*

2. *hispida*

1. *M. sativa* Linn. Sp. Pl. 778 (1753).

Decumbent or ascending, 3-5 dm. high, the young shoots and leaves with some scattered hairs. Leaflets oblanceolate or obovate, 4-25 mm. long, dentate, obtuse, truncate or emarginate and often mucronate, narrowed or cuneate at the base; stipules entire; peduncles 1-5 cm. long, bearing a short raceme; petals about 5 mm. long; pod pubescent, twisted into 2 or 3 spires.

Escaped and established in waste grounds. April to September. *Lyon* as (*M. denticulata*); *Trask*; Avalon Valley, *Nuttall* 135, 681, 739, 748, 1161, *Knopf* 156. ALFALFA.

2. **M. hispida** Gaertn. Fr. et Sm. 2:349 (1791).

Slender, much branched, decumbent, glabrous annual; leaflets obovate to obcordate, toothed above; flowers small, yellow, 2-3 or rarely more on axillary peduncles; pods coiled, their margins armed with hooked prickles.

Moist places either exposed or shady. February to April. Avalon Valley, *Trask*; *Brandegee* as (*M. denticulata*); Reservoir Hill, *Mills* 4570, 4907; ditch along the Coach Road, *Mills* 4609, *Nuttall* 60; deep, shady creek bed (Avalon Run), *Nuttall* 1082. MEDIC, BUR-CLOVER.

4. **MELILOTUS** Linn.

Herbs, with 3-foliolate leaves, dentate leaflets, their veins commonly ending in the teeth, and small white or yellow flowers in slender racemes. Calyx-teeth short, nearly equal; standard obovate or oblong; keel obtuse; ovary sessile or stipitate, few-ovuled; style filiform; pod ovoid or globose, straight, indehiscent or finally 2-valved; seeds solitary or few.

Flowers yellow
Flowers white

1. *indica*
2. *alba*

1. **M. indica** (L.) All. Fl. Ped. 1:308 (1789).

Trifolium melilotus-indica Linn. Sp. Pl. 765 (1753).

Annual; glabrous, erect, 3-20 dm. high, branching; leaflets mostly cuneate-oblong, obtuse, denticulate, 2.5 cm. long or less; racemes many, bearing small, nearly sessile, yellow flowers.

Waste grounds becoming general. February to May. *Lyon*; *Brandegee* as (*M. parviflora*); Avalon Valley, *Smith* 5042, 5101, *Mills* 4569, *Knopf* 31; Schoolhouse Ridge, *Nuttall* 30 and Middle Ranch 897. SWEET CLOVER, SOUR CLOVER.

2. **M. alba** Desv. Lam. Encycl. 4:63 (1797).

Erect or ascending, 9-30 dm. high, branching, glabrous, or the young twigs and leaves finely pubescent. Leaves petioled, rather distant; leaflets oblong or slightly oblanceolate, serrate, narrowed at the base, truncate, emarginate or rounded at the apex, 12.7-20 mm. long, 4.2-10.5 mm. wide; stipules subulate; racemes numerous, slender, 5-10 cm. long, often 1-sided; pedicels 2.1 mm. long or less; flowers white; standard 4.6 mm. long, slightly longer than the wings; pod ovoid, slightly reticulated, glabrous, 3 mm. long.

Canyon creek beds. Flowering the year around. Middle Ranch Canyon bed, *Knopf* 235; Middle Ranch creek at the ranch, *Nuttall* 653. WHITE SWEET CLOVER.

These are the first returns of this European weed on Catalina (1920-1921). It appears to be well established in the two locations indicated above and will doubtless soon spread.

5. **TRIFOLIUM*** Linn.

Herbs, with mostly 3-foliolate (occasionally 4-11-foliolate) denticulate leaves, the flowers in dense heads or spikes. Stipules adnate to the petiole. Calyx-teeth nearly equal. Petals commonly persistent, their claws adnate to the stamen-tube. Stamens diadelphous, or the tenth one separate for only a portion of its length. Ovary few-ovuled. Pod often included in the calyx, membranous, indehiscent or tardily dehiscent by 1 suture, 1-6-seeded.

Heads not involucrate:

Teeth of calyx not plumose:

Corolla rose or purple:

Teeth of calyx not ciliate:

Leaflets obcordate

Leaflets narrow lanceolate

Teeth of calyx ciliate

Corolla white

Teeth of calyx plumose:

Heads sessile

Heads pedunculate:

Peduncles 3 mm.-4 cm.

Peduncles 6-11 cm.

Heads involucrate:

Flowers not inflated:

Involucre flat

Involucre cup-shaped:

Involucral lobes ovate, pointed

Involucral lobes triangular, 3-4 toothed

Flowers inflated

1. *gracilentum*

2. *Palmeri*

3. *ciliolatum*

4. *repens*

5. *catalinae*

6. *Traskiae*

7. *insularum*

8. *tridentatum*

9. *microcephalum*

10. *microdon*

11. *stenophyllum*

1. **T. gracilentum** T. & Gr. Fl. N. A. 1: 316 (1838).

Stem 20-26 cm. high. Petioles of the middle leaves 10 cm. long; those of the lowermost and especially the uppermost leaves much shorter. Heads as large as in *T. repens*; flowers purple. Nearly glabrous; stem slender, erect or ascending; middle leaves on very long filiform petioles; leaflets cuneate-obcordate, spinulose-serrulate; stipules rather foliaceous, the lower ones linear-lanceolate and setaceously acuminate, the uppermost ovate-lanceolate and shorter: heads loose, 15-25-flowered; calyx glabrous; the teeth lanceolate-subulate, setaceously acuminate, thrice the length of the tube and about one-third shorter than the corolla; legume 1-seeded; seeds ovate, 2 x 1.5 mm., reddish-brown, slightly elongate-maculate.

Infrequent in canyons. March to May. *Mrs. Trask* (as *T. bifidum*, and as *T. catalinae* in Muhl. 9:17); *Fritchey*; *Grant*; *Kennedy* 1733.

*With the assistance of P. B. Kennedy.

2. *T. Palmeri* Wats. Proc. Am. Acad. 11:132 (1876).

A glabrous and diffuse annual, the stems ascending, about 3 dm. high or less: stipules elongated, narrowly acuminate; leaflets oblong to narrowly lanceolate, acute or acutish at each end, serrulate, 12.7-20.6 mm. long; peduncles axillary: heads naked, 10-20-flowered; flowers sessile, at length reflexed: calyx 6.3 mm. long, deeply cleft into narrow acuminate entire lobes: petals purplish, scarcely exceeding the calyx: pod 2-seeded; seed cordate-globose, 1.8 x 1.2 mm., reddish-brown, not maculate.

Grassy Canyon slopes. April-May. *Mrs. Trask*. Not otherwise collected on the island. It is more common on San Nicholas and Guadalupe Islands.

3. *T. ciliolatum* Benth. Pl. Hartw. 304 (1848).

Trifolium ciliatum Nutt. Jour. Phila. Acad. 2, 1:152 (1848). Non Clark.

Annual 1.6-3.3 dm., erect, smooth, slender, stipules falcate entire leaflets cuneate-oblong or the inferior obovate, heads long pedunculate after anthesis ovate-globose mostly depressed, flowers pedicellate mostly reflexed, calyx-teeth lanceolate acute margin scarious lacero-ciliate. Stems terete, smooth; larger leaflets about 2.6 cm.; stipules broadly lanceolate falcate above, sharply acute, entire minutely serrate-ciliate; peduncles erect 5.1-10.1 cm.: flowers rose to purple; capsule 1-seeded; seed oval 2.3 x 1.6 mm., reddish-brown, not maculate.

Canyon slopes, rare. March-May. *Mrs. Trask*. Not otherwise collected. WIRE CLOVER.

4. *T. repens* Linn. Sp. Pl. 767 (1753).

Perennial, glabrous or with a few scattered hairs, the branches often rooting at the nodes., 1-3 dm. long. Leaves long petioled; stipules ovate-lanceolate, membranous, acute, 4-12 mm. long; leaflets short-stalked, obovate, emarginate or obcordate, broadly cuneate at the base, denticulate, 8-20 mm. long; heads long-peduncled; flowers 7-12 mm. long; pedicels 2-5 mm. long, finally reflexed: corolla 2-3 times as long as the calyx; calyx-teeth acuminate, somewhat shorter than the tube; pod about 4-seeded: seed cordate-globose, 1.2 x 1 mm., pale yellow.

Waste ground. March-May. Avalon, *Mills*. 4742. WHITE CLOVER. Not before reported or collected on the island.

5. *T. catalinæ* Wats. Proc. Am. Acad. 25:128 (1890).

Low annual, branching from the base, 1 dm. high or less, appressed villous pubescent: leaflets narrowly oblong-obovate, 7 mm. long, 2.5 mm. wide, emarginate, erose-dentate; subtending stipule broadly ovate-acuminate, entire or with an occasional notch near the apex; lower stipules much narrower and with a long aristate point 2.5 mm. long: heads sessile, one or two, orbicular-ovate, subtended by a stipule and almost sessile leaf: flowers dark purple: calyx tube 2 mm.

long, strongly 10-nerved, teeth 3 mm. long, erect, somewhat rigid: corolla little exceeding the calyx teeth; vexillum 6 mm. long, 1.3 mm. wide, elliptical, minutely erose dentate at apex; legume glabrous, straw-colored, striate, acute at both ends, 3 mm. long, 1.5 mm. wide, 1-seeded: seeds yellowish-brown, devoid of markings, oblong 1.8 x .8 mm.

On ridges and dry slopes. March-May. Type collected by *Brandege*, May 13, 1890, (Herb. Gray; Photo. and fragm. in herb. Field). *Mrs. Trask*, "very rare, three localities only." Probably the *T. Macraei* of *Brandege* list. CATALINA CLOVER.

6. *T. Traskiæ* Kennedy, Muhl. 9:19 (1913).

Annual with erect branches from the base, about 2 dm. high, villous throughout, internodes long, 5-10 cm.: lower leaflets 1 cm. long, 3 mm. wide, elliptical, acute at both ends, margins coarsely dentate; upper leaflets longer and narrower, attenuate at both ends, not variable like those of *catalinae*; lower petioles 2-3 cm. long, upper much shorter, about 5 mm. long; stipules lanceolate below to broadly ovate above, lobes more or less notched and terminated by a long acumination; heads globose to ovate, pedunculate, terminal or subterminal: peduncles 3 mm. to 5 cm. long: flowers deep purple: calyx tube 1.5 mm. long, teeth 4.5 mm. long: corolla extending beyond the teeth 2 mm. vexillum elliptical, obtuse, 9.5 mm. long, 2.5 mm. wide, very finely erose-dentate at the apex: ovary 2-ovuled, ciliate with long hairs: style 5 mm. long: mature legume and seed not seen.

Dry slope near the sea. April, 1907. Type collected by *P. B. Kennedy* near Moonstone Beach. A specimen in U. S. Natl. Herb. (340315) collected by *Mrs. Trask* who says: "very rare and local, flowers purplish" is possibly this species.

7. *T. insularum* Kennedy, Muhl. 9:29 (1913).

Annual, erect, about 3.3 dm. high, branched from the base, pubescent throughout: lowest leaflets cuneate to obovate, on petioles 3 cm. long; upper leaves elliptical, margins coarsely dentate; stipules ovate-lanceolate with a long apiculation, membranaceous, glabrous below but somewhat hairy above: internodes 5-8 cm. long: peduncles 3-10 cm. long: flowers inconspicuous, purple: calyx tube 2 mm., teeth 6 mm., hirsute rather than plumose and somewhat rigid: corolla extending three-fourths the length of the teeth; vexillum 7.5 mm. long, 1.7 mm. wide, elliptical: ovary 2-ovuled: style 3 mm., long, narrow: legume 3 mm. long, 1.3 mm. wide, membranaceous, glabrous, 1-seeded: seeds reddish-brown, not mottled, narrowly oblong, similar to those of *T. catalinae*, but 2.2 x .9 mm.

On ridges and canyon slopes. March-May. Type, *Mrs. Trask* 1897 and 1901 in herb. Mo. Bot. Gard.; photo. and fragm. in herb. Field. Not again collected. ISLAND CLOVER.

8. *T. tridentatum* Lindl. Bot. Reg. t. 1070 (1827).

Annual; erect, 2-4 dm. high, glabrous; stipules setaceously lacin-

iate; leaflets linear or lanceolate, sharply serrate, 2-6 cm. long; head 2-3 cm. broad; involucre laciniate, much shorter than the flowers; flowers about 1 cm. long, bright purple with darker center; tip of standard sometimes whitish; calyx-tube 10-nerved; the teeth rigid, broad at base, abruptly narrowed to a subulate spinulose-tipped apex which is usually subtended by a short stout tooth on each side. Seed globular or nearly so, 1.7 mm. diameter, yellowish-brown, shining slightly and sparingly freckled. Flowers white, rose, or purple.

Among grasses on canyon slopes, common. March-June. *Trask*; *Brandegee*; *Carlson*; Cherry Canyon, *Smith* 5093; Gallagher's Canyon; *Millsp.* 4873; Mountain Trail above the Schoolhouse, Coach Road near Summit, and Golf Links Canyon, *Nuttall* 19, 55, 82; in patches along Pebble Beach Road, *Knopf* 6; Eagle's Nest and Moonstone Beach, *Knopf* 360, 383. THREE-TOOTHED CLOVER.

9. *T. microcephalum* Pursh. Fl. Am. Sept. 2:478 (1816).

Annual; slender, much branched, decumbent, soft pubescent; stipules ovate-acuminate, nearly entire; leaflets obovate-cuneiform or obcordate, denticulate; heads small, subglobose, many-flowered, on slender peduncles; involucre many-cleft, the segments entire; calyx-teeth subulate, broad, scarious and sometimes toothed at base; corolla minute, pinkish; pod globose, 1-seeded; seed ovate, $1 \times .8$ mm., greenish, unmarked.

Grassy places in canyons. May-September. *Lyon*; *Trask*; *Brandegee* list; *Kennedy*; Big Wash Canyon, *Nuttall* 233; Middle Ranch Canyon, *Knopf* 394.

10. *T. microdon*. H. & A. Hook. Bot. Misc. 3:180 (1883).

Trifolium microdon pilosum Eastw. Calif. Acad. Sci. 3, 1:100 (1898).

Resembling the last in vegetative characters, but with the involucre border nearly enclosing the head, its lobes triangular and 3-4-toothed, calyx smooth angled the teeth rigid broadly triangular, acute, with a narrow scarious serrulate margin. Seed oblong, 1.8×1 mm., light yellow and plentifully freckled with grayish maculations.

There appear to be several races of this species in California, but the seed characters hold too strongly to allow of varietal segregation.

Rare. Only known to us by two specimens in the National Herbarium. Collected by *Mrs. Trask* in 1903 and 1907. BUTTERFLY CLOVER.

11. *T. stenophyllum* Nutt. Proc. Acad. Sci. Phila. 1847:151 (1848).

Diffuse annual with slender stems and branches, often purplish, decumbent or ascending, 1-3 dm. long; leaflets linear, remotely serrate-toothed; peduncles filiform, much longer than the leaves; segments of the involucre oblong, cuneate at the base; head small, hemispheric; corolla purple, inflated from a narrow base to a broad, almost truncate apex; pod 2-seeded; seeds obliquely heart-shaped, 2×1.4 mm., greenish brown, transversely few-rugose.

On grassy hillsides. March-May. *Gambel* (type); *Mrs. Trask*; *Kennedy*; *Fisherman's Cove, Mills* sp. 4782; *Salta Verde, Knopf* 347.

This species probably includes, as to Catalina, *Greene's, T. brachyodon* and the *Trask* and *Brandegee* references to *T. amplexans*.

6. HESPERASTRAGALUS Heller.

Slender branched annuals. Leaves alternate, the stipules distinct and almost free from the petiole; leaflets few to many, the blades usually narrow and notched at the apex. Flowers perfect, crowded in usually short-cylindrical heads. Calyx somewhat campanulate, the lobes about equal. Corolla some shade of purple or violet, very small, barely 2 mm. long. Stamens 10; filaments diadelphous; anthers alike. Ovary sessile. Ovules two only. Pod broadly ovoid, about as broad as long (2-3 mm.), didymous, 2-celled and 2-seeded, the seeds about filling the cavity.

Pods not deflexed
Pods strongly deflexed

1. *didymocarpus*
2. *Gambelianus*

1. *H. didymocarpus* (H. & A.) Heller, Muhl. 2:87 (1905).
Astragalus didymocarpus H. & A. Bot. Beech. 334 (1840).
Astragalus catalinensis Nutt. Proc. Acad. Sci. Phila. 1848:9 (1850).

Slender, 3 dm. high, pubescent with fine, somewhat scattered hairs; leaflets 9-15, cuneate-oblong to linear, emarginate, 6-10 mm. long; spikes long-peduncled, dense, ovate or oblong, 2-3 cm. long; flowers 3-5 mm. long, dull purplish; pods erect, 4 mm. long, and about as broad, scarcely exserted from the calyx, strongly wrinkled, 2-celled, 2-seeded.

Known only from two specimens collected in February and May, one by *Gambel* and the other by *Mrs. Trask* who says: "In two canyons only." *Nuttall* doubtless misinterpreted the color of the flowers and described them as "ochroleucus."

2. *H. Gambelianus* (Sheldon) Heller *ibid*.
Astragalus gambellianus Sheldon, Minn., Bot. Stud. 1:121 (1894).
Astragalus nigrescens Nutt. Jour. Acad. Sci. Phila. 2, 1:152 (1838) non *Pall* (1800).

Stems very slender, 1-2 dm. high, slightly pubescent; leaflets as in the last; spikes less dense, cylindric, 2 cm. long; pods deflexed, well exserted from the calyx, slightly wrinkled, strongly obcompressed; closely related to the last, but easily distinguished by fruit.

Open dry situations on ridges. March to May. *Gambel*; top of the Pacific Ridge at the head of Avalon Canyon, *Nuttall* 317.

7. PHACA Linn.

Perennial or annual herbs, sometimes almost acaulescent. Leaves alternate, the stipules nearly free, often partially united: leaflets many, the blades entire. Flowers perfect, in short or elongated racemes, or sometimes nearly sessile in the axils of the leaves. Calyx campanulate: lobes more or less unequal, sometimes longer than the tube. Corolla mostly ochroleucous, occasionally purple: standard with a relatively broad blade: wings longer than the keel-petals. Stamens 10: filaments diadelphous: anthers alike. Ovary sessile or stipitate. Ovules numerous. Pod membranous, inflated, neither suture intruded, 1-celled, without even a partial partition. Seeds numerous.

Pods bladdery inflated

1. leucopsis

Pods flatly turgid:

Stipe short, scarcely exceeding the calyx

2. fastidia

Stipe long, four times as long as the calyx

3. trichopoda

1. *P. leucopsis* T. & Gr. Fl. N. A. 1:694 (1838).

Astragalus leucopsis Torr. Bot. Mex. Bound. 56 (1858).

Herb. 3.3-6.8 dm. high, tomentose-canescens; leaflets 10-15 pairs, small, oval or oblong, obtuse, scarcely petiolulate; stipules membranaceous, very small, triangular-subulate; raceme many-flowered, rather loose, on peduncles twice the length of the leaves; the flowers nodding; teeth of the calyx subulate, rather shorter than the tube; vexillum elongated; legumes large inflated, obtuse, slightly puberulent, raised on a slender stipe 4 times as long as the calyx.

Dry situations from sea level to the tops of mountains. January to June. *Lyon 88; Trask; Brandegee; Avalon vicinity, Grant & Wheeler 74/6262; Smith 5043, Millsp. 4727, Nuttall 498, 674, 730; Big Wash Canyon, Nuttall 106, 673; Pebble Beach Canyon, Knopf 44; Middle Ranch Canyon, Millsp. 4578, 4917, Nuttall 675, Knopf 317, 366; Cape Canyon, Millsp. 4676; Little Harbor, Nuttall 819; White's Valley, Knopf 315; Howland's, Millsp. 4814; Salta Verde, Knopf 345. LOCO WEED, CRAZY WEED, RATTLE WEED.*

There are many races of this species on the island, exhibiting various sizes, forms and pubescence of leaflets.

2. *P. fastidia* Kell. Hesperian 4:145 (1860).

Astragalus fastidiosus Greene Bull. Calif. Acad. 1:186 (1885).

Astragalus fastidius Jones, Contr. West. Bot. 8:7 (1898).

Similar in vegetative appearance to the last. Stipe very short, about 8 mm. long; leaflets lanceolate to narrowly-oblong, glabrous above, calyx teeth very short; pods oblong-oval, acute at base, 2.6 cm. long, somewhat oblique.

Dry situations. Only once collected on the island. June. *Mrs. Trask* (in herb. N. Y. as *A. leucopsis*). In remarking that the plant is "common" on the island, Mrs. Trask had leucopsis in mind not differentiating the two species.

3. *P. trichopoda* Nutt. T. & Gr. Fl. N. A. 1:343 (1838).*Astragalus trichopodus* Gray, Proc. Am. Acad. 6: 219 (1865).

Strigulose-puberulent or at first hoary, in age almost glabrous: stem slender, 3-9 dm. high: leaflets in many pairs, from narrowly oblong to nearly linear, about 12.7 mm. long: raceme short: flowers 8.4-10.5 mm. long: calyx-teeth very much shorter than the campanulate tube: corolla yellowish-white: pod oval, obtuse at both ends, over 12.7 mm. in length, but very much smaller and less bladdery than any other of this subdivision; its stipe only 6.3 mm. long.

Dry situations, general. May to July. *Lyon 77* (as *Antiselli*); *Brandege* (as *leucopsis*); vicinity of Avalon, *Hall 8287a*, *Beckwith 1*, *Boughton 14*, *Blake 969* (as *leucopsis*); *Pendleton 1369*, *Reed 2808* (as *Antiselli*), *Rixford*; *Rattlesnake Canyon*, *Nuttall 262*.

8. *HOSACKIA* Douglas.

Herbaceous or rarely suffrutescent; leaves pinnate, 2-many-foliolate; stipules minute and gland-like, rarely scarious or foliaceous; flowers yellow or reddish, in axillary sessile or pedunculate umbels. Calyx-teeth nearly equal, usually shorter than the tube. Petals free from the stamens, nearly equal: standard ovate or roundish, the claw often remote from the others; wings obovate or oblong; keel somewhat incurved, obtuse or somewhat acutely beaked. Stamens diadelphous; anthers uniform. Style incurved. Pod linear, compressed or somewhat terete, sessile, several-seeded, partitioned between the seeds.

- | | |
|--|------------------------|
| Leaflets 1-3, rachis terete | 1. <i>americana</i> |
| Leaflets more than 3, rachis dilated: | |
| Flowers solitary in the axils: | |
| Calyx teeth equaling the tube | 2. <i>Wrangeliana</i> |
| Calyx teeth much longer than tube | 3. <i>brachycarpa</i> |
| Flowers apical on the few-many-flowered peduncles: | |
| Peduncles 2-5-flowered, seeds smooth | 4. <i>maritima</i> |
| Peduncles 1-2-flowered, seeds tuberculate: | |
| Annuals: | |
| Flowers 9-12 mm. long | 5. <i>strigosa</i> |
| Flowers 4-5 mm. long | 6. <i>rubella</i> |
| Perennial, flowers capitate, 15 mm. long | 7. <i>anthylloides</i> |

1. *H. americana* (Nutt.) Piper, Contr. U. S. Natl. Herb. 11: 366 (1906).*Trigonella americana* Nutt. Gen. 120 (1818).*Hosackia Purshiana* Bth. Lindl. Bot. Reg. t. 1257 pt. 15 (1829).

Plant 3-6 dm. high, erect or assurgent, more or less hairy, sometimes villous, much branched; leaves nearly sessile: leaflets 10-20 mm. long, 3 (rarely 4), oblong, rather acute; peduncles longer than the leaves; bract 1-foliolate; flowers 6-8 mm. long. Calyx deeply parted; segments linear subulate, nearly as long as the corolla when the flower

first expands. Petals rose-color; the vexillum with deeper minute stripes. Legume 2.6 cm. or more in length, nearly terete, about 6-seeded, with spongy imperfect partitions between the seeds. Seeds buff dusted with dark clouding and maculate with blackish irregular spots, oblong 2 x 3.5 mm., the hilum central.

Fields and canyon washes. June to September. *Brandegee list*; Big Wash Canyon, *Nuttall 235, 679*; Graveyard Canyon, *Knopf 135*; Grand Canyon head, *Nuttall 610*. SPANISH CLOVER.

2. **H. Wrangeliana** (F. & M.) G. Don. Sweet Hort. Brit. ed. 3:165 (1839).

Lotus Wrangelianus F. & M. Ind. Sem. Hort. Petrop. 16 (1835).

Stem slender, diffuse, sparsely hirsute; leaflets 4, oblong, somewhat glaucous; peduncles axillary, very short, 1-flowered; flowers small; bracts none; legume pubescent, 12.7 mm. long; seeds 5-7, red-brown, 2.25 mm. diameter (ripe?), subquadrangular-ovate, unmarked, the hilum above the middle, i. e., at the upper third.

Found only by *Mrs. Trask* (as *H. subpinnata*) "Infrequent in certain localities," June, 1900. (in herb. N. Y.).

3. **H. brachycarpa** Bth. Pl. Hartw. 306 (1849).

Lotus humistratus Greene, Pitton. 2:139 (1890).

Resembling depauperate forms of the last but more diffuse; herb- age soft villous; flowers nearly sessile, yellow; calyx-teeth linear, much longer than the tube; pod oblong, 1 cm. long, pilose, 2-3-seeded. Seeds red-brown, 2.25 x 2 mm., strongly quadrangular, unmarked, hilum as in *H. Wrangeliana*.

Found only by *Mrs. Trask* (in herb. U. S. Natl. Mus. 340113) who says: "Rare. One locality only" (which she does not indicate), April, 1898.

4. **H. maritima** Nutt. T. & Gr. Fl. N. A. 1:326 (1838).

Lotus salsuginosus Greene, Pitton. 2:140 (1890).

Rather succulent, somewhat strigose, prostrate, much branched: leaflets 4-5, alternate, obovate, obtuse; the petioles are usually broad, so as to appear somewhat winged; peduncles 1-3-flowered, naked or with a trifoliolate bract; legume glabrous, subterete, straight: flowers numerous, yellow and rather conspicuous, the early ones solitary and without a bract. Seeds ovoid, 1.5 x 1.25 mm., greenish, mottled with fine, dark dots and heavy, irregular black stripes.

Dry sandy situations sometimes far inland. May to June. *Trask*; *Brandegee*; Pebble Beach Road, *Smith 5037, 5050, Pendleton 1375, Reed 2809, Nuttall 107, Beckwith 2, 3* (in herb. Rochester), 80, 81 (in herb. N. Y.); Rock Spring Canyon, *Knopf 137*; Equestrian Trail and Pacific Ridge, *Nuttall 318*.

5. **H. strigosa** Nutt. T & Gr. Fl. N. A. 1:326 (1838).

Lotus strigosus Greene, Pitton. 2:141 (1890).

A small plant like the following; strigosely pubescent, decumbent,

much branched; leaflets 6-9, alternate, lanceolate-linear, acute; peduncles naked, or with a bract of 1-3 minute leaflets, bracts sometimes wanting on the lowest flowers, 1-3-foliolate on the upper ones. Flowers yellow. Corolla nearly twice as long as the calyx; legume pubescent, nearly straight, about 2.6 cm. long, 7-10-seeded; seeds coarsely tuberculate, quadrate with hollowed facets, 1.5 mm. diameter.

Common on dry slopes. March to September. *Gambel* (as *Microtus nudiflorus*); *Trask*; *Brandege*; Reservoir Hill and Cherry Valley, *Millsp* 4908, 5000; Descanso and Hamilton Canyons, *Nuttall* 210; divide between White's Valley and Middle Ranch, *Knopf* 60.

6. *H. rubella* Nutt. T. & Gr. Fl. N. A. 1:326 (1838).

Lotus rubellus Greene, Pitton. 2:141 (1890).

Strigosely pubescent, much branched; leaflets 6-10, alternate, linear, rather obtuse, peduncles 1-3-flowered, naked, or with a bract of a single leaflet; legume 2.6 cm. long, pubescent, nearly straight, 7-10-seeded. Seeds yellowish-brown. With the preceding, to which it is closely allied, but with smaller and reddish flowers.

Gravelly places, dry or moist. March to May. Covering a broad, dry, heavy-gravel level in Gallagher's Canyon, *Millsp*. 4863; Coach Road and Avalon Valley, *Nuttall* 53, 145.

This species, though upright, is weak and lax, about 4 dm. high.

7. *H. anthylloides* (Gray) *Millsp. comb. nov.*

Hosackia grandiflora anthylloides Gray, Proc. Acad. Nat. Sci. Phila. 1863:350 (1863).

Low, 3.3 dm. high or less, velvety-pubescent. Leaflets of the upper leaves acute or pointed. Peduncles scarcely exceeding the leaves. Calyx-teeth attenuate, about as long as the tube. Corolla (14.8 mm. long) white and purplish-red; pods cylindric, thick-valved, glabrous, 1-2.5 cm. long; seeds reddish-brown, smooth, quadrangular, 1.25 cm. in diameter.

The type—collected by *Wallace* in 1854 (in herb. Gray). It has not been seen by later collectors.

9. SYRMATIUM Vogel.

Herbaceous or suffrutescent perennials with odd-pinnate leaves: Flowers in sessile or pedunculate umbels, the umbels bracted or bractless. Closely related to *Hosackia*, but the pods indehiscent, more or less attenuate into the style, and often arcuate.

Umbels bracted:

Calyx-teeth as long as tube, pubescence silvery 1. *ornithopum*

Calyx-teeth half as long as tube, pubescence not silvery 2. *Traskiae*

Umbels bractless:

Leaves crispid-pubescent 3. *micranthum*

Leaves glabrous:

Umbels sessile, seeds olive green, not marked. 4. *glabrum*.

Umbels pedunculate, seeds buff, freckled. 5. *dendroideum*.

1. **S. ornithopum** Greene (*ornithopus*) Bull. Calif. Acad. 2:146 (1886).

Hosackia ornithopus Greene, Bull. Calif. Acad. 1:185 (1885).

Perennial from a woody base; stems 3 dm. high, densely silky throughout, the branches many, rigid, ascending; leaves 12-24 mm. long; leaflets 4-7, 7-12 mm. long, oblong, acute at both ends; umbels numerous, on peduncles longer than the leaves, single-bracted, many-flowered; flowers 8-9 mm. long; calyx 4-5 mm. long, the teeth about equaling the tube, subulate; pod 2-3-seeded, long-rostrate, strongly curved upward. Seeds grayish-green, flat, smooth, oblong, 1.5 mm. long, 0.5 mm. broad.

Canyon washes and dry ridges, common, blooms the year around. *Lyon & Nevin; Trask; Brandegee; Moxley 721; Smith 5020; Pendleton 1400; Reed 2837; Grant 715; Grant & Wheeler 708/6257 (as Lotus tomentosus); Hasse; McClatchie; Rusby; Fisher; Davidson; Eastwood 6488, 6514; Carlson, Millsp. 4498, 4843, 4925; Nuttall 16, 1211; Knopf 49; Macbride & Payson 835; Boughton 12; Moonstone Beach, Knopf 378. SILVERY CLOVER.*

The various reports of *S. argophyllum*, *H. argophylla*, *L. argophyllus* and *S. niveum* from the island refer to the above species; *argophyllum* has much shorter calyx lobes and belongs to the Pine Belts of the mainland.

2. **S. Traskiæ** Eastw. Abrams, Fl. Los. Ang. 201 (1917).

Stems suffrutescent, erect, 4-18 dm. high, the branches appearing 2-ranked, pubescent at the tips with short white hairs, becoming nearly glabrous; leaflets 3-4, usually 3, 8-12 mm. long, linear, acute at both ends, on an elongated finely pubescent rachis; umbels on slender peduncles shorter than the leaves, with a linear bract, 2-5-flowered; flowers 1 cm. long; calyx 5 mm. long, scantily pubescent, the teeth short, pointed; corolla yellow; pod 3-4 cm. long, very slender, with a short very slender tip, thinly pubescent. No ripe fruit seen.

Dry hillsides and washes. March to June. *Trask; Grant & Wheeler 710a/2958; Davidson; Moonstone Beach, Knopf 377; Coach Road near Avalon, Nuttall 58.*

The type collection was from Mosquito Harbor, San Clemente Island, *Mrs. Trask 287.*

3. **S. micranthum** (Nutt.) Greene, Bull. Calif. Acad. 2:147 (1886).

Hosackia micrantha Nutt. T. & Gr. Fl. N. A. 1:324 (1838).

Lotus hamatus Greene, Pitton 2:150 (1890).

Stems spreading on the ground. Leaves smaller and more rounded than in the preceding species. Leaflets 4-6, cuneate or obovate, obtuse. Umbels 3-6-flowered, almost sessile, without bracts; the flowers minute, yellow. Plant pubescent (particularly the young shoots), prostrate. Teeth of the calyx short. Vexillum shorter than the keel. Legume pubescent, with a very long involute point. Pod linear-terete, minutely strigose-pilose, about 1.5 cm. long arising from a strongly incurved, U-shaped calyx, the tip strongly incurved, uncinat. Seed elongate-cylindric, smooth, red-brown, narrowing from

the rounded base to the rounded apex, 3 mm. long, 0.75 mm. in diameter at the base.

Open, moist situations. April to July. *Gambel* (as *Drepanolobus parviflorus* Nutt in herb. Gray); *Hasse*; *Grant*; Avalon Canyon at Chicken Johnny's, Big Wash Canyon, and along the Coach Road, *Nuttall* 144, 232, 54.

The species is well represented on the mainland by: *Hasse*, April, 1890, Sterile Hills, Los Angeles County; *Parry*, May, 1882, San Diego; *Parish* 2172, San Bernardino, June 3, 1891; and *F. E. & E. S. Clements* 146, La Jolla.

4. ***S. glabrum* Vog.** *Linnea* 10: 591 (1836).

Hosackia glabra Torr. Bot. U. S. Expl. Exped. 2: 274 (1856).

Suffrutescent, tufted and reedy, 5-10 dm. high, erect or decumbent, nearly glabrous; leaflets mostly 3, oblong to linear-oblong, 6-12 mm. long, obtuse or acute; umbels numerous, sessile; flowers 6-8 mm. long, yellow, turning reddish; calyx 3-5 mm. long; the teeth subulate, erect, slightly less than half as long as the tube. Pod long pointed. Seed 1, olive green, cylindric, very slightly curved, rounded at both ends, not maculate, 2 x 0.75 mm.

In the beds of canyons. Blooms the year around. Avalon Run, *McClatchie*, *Brandegee** (as *S. dendroideum* in herb. Field), *Moxley* 722, *Nuttall* 948; Big Wash Canyon, *Nuttall* 678, 961; 1004-1006; along the Coach Road, *Nuttall* 727; Descanso Canyon at the upper end, and along the Coach Road between Howland's and Johnson's, *Mills* 4495, 4819; Pebble Beach Canyon, *Knopf* 4. Apparently much commoner than the next.

5. ***S. dendroideum* Greene**, Bull. Calif. Acad. 2: 146 (1886).

Lotus dendroideus Greene, Pitton. 2: 148 (1890).

Shrubby, the stems erect, 2-5 cm. thick, the branches numerous, short, their tips densely silky-pubescent; leaflets 3-5, on a dilated rachis, 4-8 mm. long, oblong, obtuse; umbels on peduncles shorter than the leaves, bractless, many-flowered; flowers 7-8 mm. long; calyx 4 mm. long, densely pubescent, the teeth short and blunt, hairy; pod 2-seeded, 11 mm. long, slightly curved with a short tip. Seeds buff, freckled with irregular, brown spots, cylindric, more curved than the last, rounded at both ends, 2.5 x 1 mm.

At the West End, *Lyon & Nevin* (as *Hosackia glabra* in herb. Gray); *Macbride & Payson* 855 (as *H. glabra* in herb. Gray); Pebble Beach Road, *Smith* 5047; Pebble Beach Canyon, *Nuttall* 493.

10. VICIA Linn.

Climbing or trailing, herbaceous vines, with pinnate tendrill-bearing leaves, half-sagittate or entire stipules, and axillary, mostly

*Brandegee says (*Zoe* 1: 111 & 135): A polymorphous species (*S. glabrum*, *dendroideum*, *patens*) growing usually in slender clustered form of the mainland, but sometimes with a considerable elongation of the woody base, when it becomes *S. dendroideum*. An observation based upon the varying vegetative characters (there being many races of both the species), but the seeds, even though but partly mature, readily differentiate the plants. We have not seen the seeds of the following Catalina specimens credited to *dendroideum*: *Eastwood* 6458; *Parish* 10762.

racemose, flowers. Calyx-tube somewhat oblique, obtuse at the base, its teeth about equal. Standard obovate or oblong, emarginate, clawed; wings obliquely oblong, adherent to the shorter oblong curved keel. Stamens diadelphous (9 and 1), or monadelphous below. Ovules ∞ ; style very slender, with a tuft or ring of hairs at its summit. Pod flat, dehiscent, 2-valved, continuous between the seeds.

1. **V. exigua** Nutt. T. & Gr. Fl. N. A. 1:272 (1838).

Slender annual, 20-60 cm. high, more or less pubescent: leaflets about 4 pairs, linear, acute, 12.7 mm.-2.6 cm. long: peduncles usually short, rarely 2-flowered: flowers 6.3 mm. long, purplish; calyx-teeth lanceolate, nearly equalling the tube: pod smooth, linear-oblong, about 6-seeded. Seeds globular, 2.25 mm. diameter, dark-brown, rather densely marked with irregular, darker maculations.

In grassy places. March to May. *Gambel*; *Miss McClatchie*; *Brandegge*; *Smith 4970*; upper Pebble Beach Road, *Nuttall 108, 684*; near the summit of the Equestrian Trail and Hamilton and Silver Canyons, *Nuttall 543, 228, 683*; Big Wash Canyon, *Millsp. 4853, Nuttall 238*; Cottonwood Canyon, *Knopf 395*. VETCH.

II. **LATHYRUS** Linn.

Herbaceous vines, rarely erect herbs, with pinnate mostly tendril-bearing leaves, and racemose or sometimes solitary flowers. Calyx oblique or gibbous at the base, its teeth nearly equal or the upper ones somewhat shorter than the lower; corolla nearly as in *Vicia*, but commonly larger; stamens diadelphous (9 and 1), or monadelphous below. Ovary sessile or stalked; ovules generally numerous; style curved, flattened, hairy along its inner side; pod flat, or sometimes terete, 2-valved, dehiscent, continuous between the seeds.

1. **L. Alefeldi** White, Bull. Torr. Club. 21:449 (1894).

Orobis californicus Alef. Bonpl. 9:146 (1861) ex. syn. not
Lathyrus californicus Dougl.

Perennial; glabrous or sparingly pubescent throughout; stem rather stout, flexuous, quadrangular, wingless, scarcely striate between the angles; stipules semi-cordate, acuminate, thick and strongly reticulated, one-third to one-half as long as the leaflets, and often nearly as broad, the lower lobe very coarsely acuminately toothed, leaflets 6-10, alternate or in pairs, oblong to ovate or obovate, obtuse, frequently retuse, thick and stiff, prominently reticulated, glabrous on both surfaces, 1.5-4 cm. long, one-half to one-third as broad; tendrils long, stout and trifid; peduncle 6-10-flowered, twice as long as the corresponding leaf; flowers large 2-3 cm. long; corolla purple, pedi-

cels longer than the calyx-tube, calyx dilated, pubescent, particularly on the margin; upper calyx-teeth broadly triangular, acute, lateral pair oblong-lanceolate, and the lowest coriaceous, subulate, the three lower teeth equalling the tube, the upper shorter; legume flat, sparingly pubescent, about 8-seeded.

Moist shady banks or among grasses. January to May. The many flowered, ovate-leaved race: *Lyon*; *Trask*; *Brandegge* (as *L. vestitus*); trail to Summit and in Cherry Canyon, *Smith* 5030, 5094; shady, rich banks along Avalon Run, *Mills* 4736; Golf Links Canyon and Big Wash Canyon, *Nuttall* 77, 1085.

The (sometimes) fewer-flowered, narrow-leaved race: dry stream-bed in open pasture, Middle Ranch, *Mills* 4607a; ridge between Rock Spring and Rock Falls Canyons, *Moxley* 690; Schoolhouse Ridge and Pebble Beach Canyon, *Nuttall* 45, 205, 676; ridge between Descanso and Hamilton Canyons, *Knopf* 38. WILD SWEET PEA.

There are many races of this plant some with more and larger flowers, some with broadly oval to ovate leaves, others with ovate-lanceolate to linear, but all may appear on one stem. These races do not even remain constant as to shady or exposed situations though the broader leaves are more common to shade and the narrower to exposure. The synonymy would be difficult to settle upon except through extended field work, copious notes, ripe fruit, and a goodly series of well prepared specimens. Apparently (at this writing) the following species are included in this: *L. strictus* Nutt. (this would supplant Alefeldi) and *L. violaceus* (!) *Barberae* White; but possibly not *L. vestitus* Nutt., *L. violaceus* Greene, and *L. puberulus* White. All attempts to properly classify vines or climbing plants through leaf-forms and sizes; inadequate herbarium material; or worse still by cultivation from seed, in which case characters can not remain constant, appears to us worse than futile.

[*Genista linifolia* Linn. The European DYERS' GREEN-WOLD grows as a silvery, yellow-flowered bush, four feet high, at the summit of the cable railway on the south hill above Avalon, where it blooms profusely from March to April (*Mills* 4836). It has not, so far, shown a tendency to become naturalized.]

[*Acacia* sps. There have been transplanted to the hill path above Lover's Cove, several species of *Acacia* of evident Australian origin (*Nuttall* 101, 119, 672). They are growing and fruiting luxuriantly but have, so far, shown no tendency to reproduce on the island.]

[*Mucuna* sp. One of the old fishermen claims to have collected in 1915, "about a dozen sea beans" (*Knopf* 206) from "a bush growing at the base of a seaside hill in one of the bays of the island shore." He claims to have no positive remembrance of the exact spot, and that they might possibly have been from a vine climbing over the bush. Though he has attempted to guide Mr. Knopf to the locality, no specimen has, as yet, resulted.]

Order 10. GERANIALES.

Herbs, shrubs, trees or sometimes succulent or tender plants or woody vines with tissues with or without secreting glands or cells. Leaves various in position and form. Calyx and corolla regular or

irregular sometimes appendaged with a spur or sac. Stamens as many as the sepals or petals sometimes twice as many, rarely more; anthers opening lengthwise. Ovary superior, mostly compound; ovules pendulous, the raphe toward the axis of the ovary.

Petals evident, usually as many as the sepals.

Flowers regular or very nearly so:

Tissues devoid of secreting cells or glands:

Leaves palmately cleft, parted or divided.

Leaves compound.

Leaves peltate.

Tissues with secreting cells or glands:

Leaves punctate.

Flowers often apetalous, monoecious; carpels mostly 3.

1. GERANIACEAE.

2. OXALIDACEAE.

3. TROPAEOLACEAE.

4. RUTACEAE.

5. EUPHORBIACEAE.

Family 1. GERANIACEÆ.

GERANIUM FAMILY

Annual, biennial or perennial herbs with erect scape-like or diffusely dichotomous stems. Leaves normally opposite, stipulate, blades toothed, lobed, or more or less pinnately, palmately or pedately cleft, parted or divided. Flowers regular, cymose; calyx of 5 imbricate persistent sepals each often terminating in a subulate tip which is occasionally bristle-appendaged; corolla of 5 white or colored deciduous petals; receptacle with or without 5 glands. Androecium of 10 or rarely 5 or fewer stamens the filaments united at the base. Gynoecium of 5 carpels whose styles are adnate to an elongate central column from which they break at maturity; each carpel 2-ovulate but maturing but 1 seed. Seed with little endosperm; cotyledons folded, incumbent.

Tails of the carpels not bearded:

Fertile stamens 10.

Tails of the carpels bearded inside:

Fertile stamens 5.

1. GERANIUM.

2. ERODIUM.

1. GERANIUM Linn.

Annual or perennial herbs the rootstocks, when present, terminating in a simple or branched caudex. Leaves opposite; blades palmately or radially lobed, cleft or parted; Sepals 5, usually awn-tipped, occasionally awnless. Petals 5, often pubescent near the base, not markedly differentiated into claw and blade. Stamens 10 or rarely 5; filaments usually ciliate near the base. Style column usually beaked, the styles glabrous within, not spirally twisted when freed from the axis. Carpel bodies turgid, permanently attached to the styles.

rounded at the base, not appendaged at the top. Seeds smooth, reticulate or pitted.

1. **G. carolinianum** Linn. Sp. Pl. 682 (1753).

Annual or biennial. Stem simple below, erect, or branched at the base, branches ascending or rarely spreading, more or less glandular pubescent; leaf blades 3-6 cm. broad, reniform or orbicular-reniform in outline, slightly angular, the main divisions cleft or parted, lobes oblong or linear-oblong; peduncles and pedicels relatively short forming a congested inflorescence; sepals awn-tipped the outer ones 6-10 mm. long, ovate or broadly ovate the awn tips rather long; petals pink or whitish about as long as the sepals; style-column 12-18 mm. long at maturity, with somewhat spreading often glandular hairs; carpel bodies 3-3.5 mm. long, pilose with erect hairs; seeds reticulate.

Shady situations in cañons. June to July. Cañon opposite Chicken Johnny's, June 16, 1920; Nuttall 342; Trask (N. Y., Feld); Brandegee. CRANESBILL, WILD GERANIUM.

2. **ERODIUM** L'Her.

Annual or perennial herbs at first acaulescent later with more or less elongated stems. Leaves opposite; blades merely toothed or pinnatifid or pinnately divided, often long-petioled. Sepals 5, the awn-tips sometimes bristle appendaged. Petals 5, those of the later flowers reduced more than in the earlier ones. Stamens 5, alternating with 5 staminodia. Style column conspicuously elongate, the styles pubescent within and spirally coiled when free from the central axis. Carpel-bodies narrow, acute at the base. Seeds smooth.

Leaf divisions large, ovate:

Sepal tips nude.

1. *moschatum*.

Leaf divisions small, narrow:

Sepal tips long bristled.

2. *cicutarium*.

1 **E. moschatum** (L.) L'Her. Ait. Hort. Kew. ed. I, 2: 414 (1789).

Geranium moschatum Linn. Sp. Pl. 680 (1753).

Leaves 5-12 cm. long or sometimes shorter; blades pinnately divided, the segments ovate or oblong-ovate 1-3 cm. long, toothed or pinnately cleft, the lobes toothed; peduncles and pedicels glandular-pubescent; sepals with a short, subulate tip destitute of bristles, the outer 6-7 mm. long, oblong or elliptic-oblong; petals slightly longer than the sepals; anther-bearing filaments 2-toothed; style-column 3.5-4.5 cm. long in fruit, puberulent. Seeds elongated pyriform, 4 mm. long.

Very abundant in meadows and moist, grassy places, becoming more plentiful through its rank and rapid growth than the next species. January to June. On the Coach Road at the Wishbone, January 10, 1920, *Mills* sp. 4563; roadside

and fields at the Isthmus, 4627, 4919. The earlier collectors do not report its presence on the Island. *Mrs. Trask* distributed it as *E. cicutarium* (N. Y., Field). PIN CLOVER.

2. *E. cicutarium* (L.) L'Her. *supra*.

Geranium cicutarium Linn. *supra*.

Leaves 5-12 cm. long, pinnately divided, the segments narrowly oblong pinnatifid or incisely toothed; peduncles and pedicels more or less hirsute rarely glandular; sepals with short tips furnished with 1-3 bristle-like appendages, the outer 6-7 mm. long, oblong or nearly so; petals somewhat longer than the sepals; anther-bearing filaments toothless; style-column 3-4 cm. long in fruit; minutely pubescent; seeds 2.5 mm. long.

Common on dry banks, roadsides and in arid situations. January to June. The beautiful, radiate, flat rosettes just appearing in bloom January 10, 1920, on the dry, trodden margin of the Coach Road at the Wishbone, *Millsp.* 4562; slopes of the high hill back of the Avalon School House, May 29, 1920, *Nuttall* 31; *Knopf* 25; *Trask*; *Lyon*; *Brandege*. FILAREE (a corruption of the Spanish name *Alfilerilla*). It is asserted that, some years ago, a Mexican sheep herder, knowing the value of this plant as fodder, was wont to carry a quantity of the seed with him on his rides about the island and sow it broadcast in all new localities he visited.

Family 2. OXALIDACEÆ.

SORREL FAMILY

Herbs, commonly with horizontal or bulb-like rootstocks, or shrubs or trees. Leaves alternate, sometimes all basal, rarely reduced to phyllodia; stipules free, adnate to the petiole, or obsolete, blades compound, commonly palmately or pinnately 3-foliolate or often several-many-foliolate, or rarely 1-foliolate but predominately with obcordate or obreniform blades. Flowers perfect, nearly regular but unsymmetrical, borne in simple or compound cymes which terminate peduncles. Calyx of 5 herbaceous or rarely petaloid sepals. Corolla of 5 various colored or white petals. Androecium of twice as many stamens as there are sepals, in 2 rows; filaments united at the base, the longer ones sometimes appendaged on the back; anthers 2-celled, versatile. Gynoecium 5-carpellary, the carpel bodies united; styles distinct or merely coherent; stigmas terminal or introrse, entire or cleft. Ovules several or many in each carpel, or rarely only 1 or 2. Fruit a capsule with each carpel opening by a longitudinal valve, or a berry. Seeds transversely wrinkled.

Acaulescent:

Rootstock elongate with bulblets at the nodes. 1. BOLBOXALIS.

Cauliscent:

Rootstock from an elongated tuberous root. 2. XANTHOXALIS.

1. **BOLBOXALIS** Small.

Perennial succulent herbs with rootstocks which bear bulblets at their nodes. Leaves alternate but clustered; petioles elongate; blades palmately 3-foliolate; leaflets sessile, with broadly obcordate or somewhat obreniform blades. Flowers borne in umbel-like cymes subtended by scale-like bracts; sepals 5, nearly equal, or the inner ones slightly narrower than the outer, each bearing a pair of apical tubercles; petals 5, yellow, typically large and conspicuous. Stamens 10, filaments united at the base, the longer ones appendaged on the back. Ovary elongate; styles slender; stigmas capitate. Capsule oblong or columnar. Seeds tuberculate, wrinkled.

1. **B. cernua** (Thunb.) Small N. A. Flora 25:28 (1907).
Oxalis cernua Thunb. Diss. Oxal. 14 (1781).

Plants 1-4 dm. tall, bright green; leaflets 2-3.5 cm. broad or less, the blades very broadly obcordate, glabrous or sometimes pubescent beneath; peduncles surpassing the leaves, glabrous at least in age; pedicels 4-20, more or less pubescent; sepals lanceolate to linear-lanceolate, 4.5-6.5 mm. long, the outer ones more pubescent than the inner; petals deep yellow, 2-3 cm. long; filaments glabrous; gynæcium pubescent; capsules 5-8 mm. long.

A native of the Cape of Good Hope thoroughly and plentifully established on the grassy east slopes of Descanso Cañon (*Mills* sp. 4542, Jany. 5, 1920) and in many other localities in the vicinity of Avalon.

2. **XANTHOXALIS** Small.

Herbs with horizontal rootstocks or with merely annual tap-roots; or shrubs. Leaves alternate, often clustered at the nodes, the stipules obsolete or merely dilations at the base of the petiole; blades palmately 3-foliolate, the leaflets mostly about as wide as long, or wider and obcordate, or rarely broadest near the base and merely obtuse, acute or acuminate, all sessile. Flowers borne in umbel-like or dichotomous cymes, the stalk not joined. Sepals 5, herbaceous or petaloid, the inner ones often slightly narrower than the outer; petals 5, yellow or purplish and rarely darker at the base, deciduous, broadened upward; stamens 10, the filaments united in a tube at the base. Ovary mostly elongate; styles filiform or subulate. Capsule columnar to oblong, or decidedly narrowed upward, prismatic, erect. Seeds transversely ridged, the ridges sometimes broken up into tubercles.

1. **X. californica** Abrams Bull. Torr. Club 34:264 (1907).

Stems erect or decumbent, 1-4 dm. tall, with scattered, appressed or lax hairs, or nearly glabrous in age, tufted on long-fusiform woody roots; leaves bright green, the blades 7-16 mm. broad with scattered hairs on both surfaces and ciliate; peduncles much longer than the petioles; pedicels strigillose relatively long and often conspicuously elongate and refracted in fruit; sepals 5-6.5 mm. long at maturity, usually purple-margined and tipped; petals orange-yellow, salmon on the outer surface, 9-13 mm. long; longer filaments glabrous; capsules columnar, very stout, 11-16 mm. long, minutely pubescent, rather abruptly narrowed at the apex; seeds ovoid, 1.8 mm. long, transversely anastomose-wrinkled.

On dry banks in cañons. April to June. Silver Cañon, March 27 (not in flower) 1920, *Millsp.* 4879; Rock Spring Cañon, May 6, 1920 (in full flower and ripe fruit), *Nuttall* 127, 745; *Knopf* 91; *Mrs. Trask* (N. Y.);

Family 3. **TROPÆOLACEÆ.**
NASTURTIIUM FAMILY

Twining or spreading annual or perennial sometimes tuberous herbs with usually peltate leaf-blades which are angled, lobed or dissected, axillary, 1-flowered peduncles or the flowers rarely in umbels. Flowers irregular, perfect, the hypanthium produced backward into a spur. Sepals 5, imbricate or valvate, connate at the base. Petals 5, rarely fewer by abortion, imbricate, the upper ones exterior and more or less dissimilar to the lower and on account of the posterior enlargement of the hypanthium, at some distance from the stamens. Stamens 8, free, unequal, declinate. Ovary 3-lobed, 3-celled; style single, apical, filiform, the branches short, introrsely stigmatic. Ovule solitary, pendulous from the apex of the cell. Fruit with the carpels persistent a short time and then separating from the axis, indehiscent, indurated, fleshy, wrinkled. Seed without endosperm; cotyledons thick, fleshy; hypocotyl very short.

1. **TROPÆOLUM** Linn.

Characters of the family as above.

1. **T. majus** Linn. Sp. Pl. 345 (1753).

Leaves orbicular, peltately nerved, slightly 5-lobed by crenations, the apical nerve not exerted beyond the margin; petals obtuse.

A well-known Peruvian plant: our common garden **NASTURTIIUM**, widely escaped and established in moist, grassy places, in the vicinity of Avalon (*Millsp.* 4537, Jany. 3, 1920), Banning's Landing; Cherry Valley; and Howland's, this latter location far removed from dwellings of any character.

Family 4. **RUTACEÆ.**

RUE FAMILY

Trees or shrubs, rarely herbs, with heavy-scented and glandular-punctate foliage, mainly compound estipulate leaves, and perfect or polygamo-diœcious flowers. Sepals 4 or 5, or none. Petals 4 or 5, hypogynous or perigynous. Stamens of the same number, or twice as many, distinct, inserted on the receptacle; anthers 2-celled, mostly versatile. Disk annular. Pistils 1-5 distinct, or 1 and composed of 2-5 carpels, inserted on the receptacle. Fruit various, a capsule, berry or samara.

1. **RUTA** Linn.

Perennial caulescent sometimes partly woody herbs, with glandular-punctate foliage and often heavy scented herbage. Leaves alternate; blades divided. Flowers in terminal corymbose or paniced cymes. Sepals 4-5, persistent. Petals 4-5, yellow or greenish, imbricated. Disk thick, 8-10-lobed. Stamens 8-10. Ovary 4-5-celled, sessile, 4-5-lobed; styles united; stigma terminal. Ovules several in each cavity of the ovary. Capsule 4-5-celled, 4-5-lobed, commonly opening at the apex. Seeds several.

1. **R. graveolens** Linn. Sp. Pl. 383 (1753).

Stems 2-8 dm. tall, corymbose at the ends: leaf-blades twice ternately divided, the ultimate segments rounded or notched at the apex: sepals triangular or ovate, 2.4-4 mm. long: petals 5-7 mm. long, the broad blade with involute margins and apex, abruptly narrowed into the claw: capsules depressed, 8-11 mm. wide, 4-5-lobed.

Waste grounds. April to May. Avalon Valley near Chicken Johnny's, *Mills* sp. 4647. RUE. The plants are quite woody and appear like shrubs. This is the only station so far known, for this European immigrant, on the island.

Family 5. **EUPHORBIACEÆ.**

SPURGE FAMILY

Herbs, shrubs, or trees, with milky acrid juice, monœcious or diœcious commonly apetalous and often naked flowers, a free and usually 3-celled ovary, having one or a pair of collateral anatropous ovules (solitary in our species) pendulous from the summit of each cell, and maturing into a mostly 3-celled and 3-lobed elastically dehiscent capsule, the lobes septicidally separating and then loculicidally splitting into two valves, leaving a central axis; the crustaceous

seeds with a large and straight embryo (having usually broad cotyledons) in the axis of rather scanty albumen. Stamens 1 to many. Styles or stigmas as many or twice as many as the cells of the ovary. Leaves mostly alternate and simple, often stipulate.

Flowers without an involucre:

Capsule 1-celled.

1. EREMOCARPUS.

Capsule 3-celled.

2. RICINUS.

Flowers in a cup-shaped involucre:

Involucral glands unappendaged.

3. TITHYMALUS.

Involucral glands with petaloid appendages:

Leaves aequilateral, scattered.

4. TRICHEROSTIGMA.

Leaves inaequilateral, opposite.

5. CHAMAESYCE.

1. EREMOCARPUS Benth.

Flowers monœcious, in axillary cymose fascicles, without involucre and apetalous, and the pistillate without calyx. Staminate calyx 5-6-parted, slightly imbricate. Stamens 6 or 7, central on the hairy receptacle (disk obsolete): filaments exserted: anthers inflexed in the bud. Ovary with 4 or 5 small glands at the base, 1-celled, 1-ovuled; style simple, filiform, stigmatic at the apex. Capsule obovate-oblong, 2-valved. Seed smooth and shining: albumen fleshy. Cotyledons broad, cordate, as long as the radicle. — A low heavy-scented annual, with alternate entire 3-nerved petiolate leaves, without stipules.

1. *E. setigerus* (Hook.) Bth. Bot. Sulph. 53, t. 26 (1844).

Croton setigerus Hook. Fl. Bor. Am. 2: 141 (1838).

Piscaria setigera Piper, Fl. Wash. 383 (1893).

Hoary throughout with a very dense stellate pubescence and hispid with stiff spreading hairs: stems stout, dichotomously branched from the base, mostly procumbent or ascending, 3.3 dm. long or less: leaves thick, ovate, obtuse, cuneate or rounded at base, 12.7 mm.-5.1 cm. long, on long petioles, the upper crowded and apparently opposite or ternate: staminate flowers pedicelled; calyx with oblong obtuse segments 2.1 mm. long: pistillate flowers in the lower axils, 1 to 3 together: ovary and style densely pubescent: capsule and seed 4.2 mm. long.

On dry, grassy upland levels. May to Sept. *Brandegee*; *Lyon* (lists); *White's Landing*, *Smith* 5172; *Summit*, *Millsp.* 4918 (fruit only); ridge west of Avalon and at *Summit*, *Nuttall* 284, 639. TURKEY MULLEIN.

2. RICINUS.

A tall stout monœcious herb, glabrous and glaucous, with alternate large peltate palmately lobed leaves, and numerous small apetalous greenish flowers in terminal racemes, the pistillate above the sta-

minate. Staminate flowers with a 3-5-parted calyx, the segments valvate, and numerous crowded stamens; filaments repeatedly branched. Pistillate flowers with a caducous calyx. Capsule subglobose, or oval, separating into 3, 2-valved carpels. Endosperm fleshy and oily. A monotypic genus.

1. **R. communis** Linn. Sp. Pl. 1007 (1753).

Stems erect, 1-5 m. tall, more or less branched, becoming tree-like in warm regions. Leaves nearly orbicular in outline, 1-6 dm. broad, 6-11-palmately lobed and peltate, the lobes toothed, acute, or acuminate; capsule 12-16 mm. in diameter, usually spiny; seeds shining, smooth, black variegated with white, or mottled with gray and brown markings.

Escaped from cultivation, and thoroughly established, in the vicinity of Avalon, January to December. *Mills* sp. 453⁸. CASTOR BEAN. CASTOR OIL PLANT.

3. **TITHYMALUS** (Tourn.) Adans.

Annual or perennial milky herbs or shrubby plants with simple or branched stems topped by several-rayed cyme-like umbels. Leaves below the umbel scattered or alternate, estipulate, often broadened upward; bracts of the umbel quite different from the stem-leaves, entire or toothed. Involucres sessile or peduncled, the lobes often toothed; glands 4, transversely oblong and appearing reniform by the cornuate extremities or appendages. Capsule smooth or tuberculate: cocci rounded or more or less carinate. Seeds variously pitted, often carunculate.

Pods warty, glands discoid, entire.

1. *dictyospermus*.

Pods smooth, glands crescent shaped, 2-horned.

2. *leptocerus*.

1. **T. dictyospermus** (F. & M.) Heller, Muhl. 1:56 (1904).

Euphorbia dictyosperma F. & M. Ind. Hb. Petrop. 2:37 (1835).

Annual, glabrous, usually erect, 15 cm.-4 dm. high: stem simple below or often branching from the base dichotomously branched above: cauline leaves scattered, oblong to obovate-spatulate, obtuse and obtusely serrulate, often retuse, 1.2-3.8 cm. long; on the branches opposite, broadly ovate to oblong, the floral ones round-ovate, subcordate, mucronate, 4-6 mm. long: rays usually 3, 2 to 4 times forked: involucres and glands small: style bifid or parted: capsule with rounded and warty lobes, 2-3 mm. long: seeds sub-globose, delicately net-veined, dark colored with thin flattened caruncle.

Dry, open situations, March to May. "Rare in few localities." *Trask*; *Brandegee* list; hillside at Fisherman's Cove and Pebble Beach flat. *Mills* sp. 4786, 4886.

2. **T. leptocerus** (Engelm.) Millsp. *comb. nov.*
Euphorbia leptocera Engelm. Pac. R.R. 4:135 (1857).

Annual or sometimes biennial, glabrous, erect or decumbent at the branching base, 3 dm. high: leaves obovate-spatulate, obtuse, often mucronate, 1.2-3 cm. long, the upper ones sometimes erose-denticulate; those on the branches and the floral ones opposite or usually ternate, deltoid or broadly rhombic-ovate, sometimes connate, acute, 6-12 mm. broad: branches 2 or 3 times dichotomous, the upper nodes much the shorter: involucre turbinate, the oblong lobes nearly entire; glands large, crescent-shaped, the slender horns sometimes cleft: styles elongated, bifid: capsule 4 mm. broad: seeds usually ash-colored, oblong-ovate, conspicuously dark-pitted, nearly 3 mm. long, with a prominent caruncle.

Dry situations in canyons, March to June. In the arroya of Gallagher's Canyon, *Millsp.* 4867; in the arroya of Avalon Run and of Big Wash Canyon, *Nuttall* 170, *Davidson*; on the crest of the ridge at the left of Big Wash, *Nuttall* 236. SPURGE.

4. **TRICHEROSTIGMA** Kl. & Gke.

Shrubs, with erect or procumbent stems and more or less succulent tissues. Leaves scattered, few, usually fugacious: blades small, becoming firm. Stipules none. Involucres solitary, and subtended by fleshy bracts near the ends of the branches, or in axillary cymes, hemispheric, pubescent within; lobes toothed or fimbriate. Glands 5, subtended by entire petal-like appendages. Capsule 3-lobed, exserted. Seeds 4-sided, somewhat wrinkled.

1. **T. miserum** Kl. & Gke. Monatsbl. Akad. Berl. 248 (1859).
Euphorbia misera Bth. Bot. Sulph. 51 (1844).

A much branched straggling shrub, 6-9 dm. high: young branches pubescent: leaves minutely puberulent or glabrate, solitary or few upon the short branchlets, round-obovate, obtuse or retuse, mostly cuneate at base, 4-12 mm. long, exceeding the petioles; stipules fimbriate: involucre hemispherical, solitary and terminal, 2.1 mm. long; lobes short, inflexed; glands purple, with a white crenulate margin: capsules 4.2 mm. long, with rounded lobes, somewhat warty: seeds round-ovate, reticulate-wrinkled or obscurely pitted, 3.5 mm. long.

Coastal slopes and rocky shores, December to August. On rocks, scarcely above high tide, between Lookout Point and Seal Rocks, *Trask*, *Hasse*.

5. **CHAMÆSYCE** S. F. Gray.

Annual or perennial herbs or shrubs, the stem often diffuse at

the base; the branches prostrate or ascending, forking. Leaves opposite, inaequilateral, more or less oblique at the base, entire or toothed; stipules minute, entire or lacerate. Inflorescence solitary or capitulate, axillary and terminal; involucre toothed, glandular on the margin; glands 4, naked or appendaged (the 5th gland represented by a sulcus in the margin of the involucre tube). Capsule more or less globose, 3-coccos, the cocci sharply angled or rounded; seeds minute, ovoid or elongated-ovoid, more or less quadrangular, the facets smooth or transversely ridged.

1. *C. serpyllifolia* (Pers.) Small, Fl. SE. U. S. 712, 1333 (1903).
Euphorbia serpyllifolia Pers. Ench. Bot. 2:14 1807).

Annual, dark green, or becoming reddish, glabrous. Stems branched from the base, the branches slender, prostrate or ascending, 1-4 dm. long: leaf-blades oblong to spatulate, 3-12 mm. long, obtuse or retuse, nearly entire, or serrulate above the middle, short-petioled, the base oblique, mostly truncate or obtuse: stipules at length a fringe of weak bristles: involucre solitary in the axils, sometimes clustered toward the ends of the branchlets, over 1 mm. long: glands 4, disk-like; appendages narrow, lobed: capsules 2 mm. broad, slightly nodding; seeds ovoid, hardly 1 mm. long, 4-angled, the facets transversely wrinkled.

Flatly prostrate in dry, open places. June to December. Avalon Valley, Trask; Brandegee list; Pendleton 1398; Nuttall 605; Knopf 232. GROUND SPURGE.

Order II. SAPINDALES.

Mostly trees or shrubs. Petals usually present and separate. Sepals mostly distinct. Stamens rarely more than twice as many as the sepals, when as many or fewer, opposite them. Ovary superior, compound. Ovules pendulous, with the raphe away from the axis of the ovary, or erect or ascending.

Family I. ANACARDIACEÆ.

SUMAC FAMILY

Trees or shrubs, with acrid resinous or milky sap, alternate or rarely opposite leaves, and polygamo-dioecious or perfect, mainly regular flowers. Calyx 3-7-cleft. Petals of the same number, imbricated in the bud, or rarely none. Disk generally annular. Stamens as many or twice as many as the petals, rarely fewer, or more, inserted at the base of the disk; filaments mostly separate; anthers commonly

versatile. Ovary in the staminate flowers 1-celled. Ovary in the pistillate flowers 1- or sometimes 4-5-celled; styles 1-3; ovules 1 in each cavity. Fruit generally a small drupe. Seed-coat bony or crustaceous; endosperm little or none; cotyledons fleshy.

Leaves trifoliate, deciduous.

Leaves simple, evergreen:

Ovary and fruits viscid and hairy.

Ovary and fruits smooth.

1. TOXICODENDRON.

2. NEOSTYPHONIA.

3. MALOSMA.

1. TOXICODENDRON Mill.

Shrubs, small trees, or vines climbing by aerial rootlets, with 3-foliolate or pinnate leaves poisonous to the touch, and axillary panicles of small, greenish or white polygamous flowers. Calyx 5-cleft; petals and stamens 5; ovary 1-ovuled; style terminal. Drupes small, glabrous, or sparingly pubescent when young, the stone striate.

1. **T. diversilobum** (T. & G.) Greene, Leaflets 1:119 (1905).

Plate XIII, f. 3.

Rhus diversiloba T. & G. Fl. N. A. 1:218 (1838)

Nearly glabrous; stem erect or climbing, with short leafy branches; leaves 3- (rarely 5-) foliolate; leaflets very obtuse, in the pistillate plant slightly in the staminate, rather deeply pinnately lobed; lobes very obtuse, the incisions acute; panicles axillary, racemose; drupes subglobose.

Moister hillside woods and canyon bottoms. February to May. Frequent as an erect shrub 3-4 m. high, or climbing to greater heights. *Lyon; Trask; Brandege;* Gallagher's Canyon, *Eastwood* 6468; Swain's Canyon, *Nuttall* 622; Banning's Canyon at the mouth, *Millsp.* 4596; Avalon Canyon, on the hillside bank of Avalon Run, *Smith* 5069, *Millsp.* 4716, 4731. POISON IVY, POISON OAK, FIVE-LEAVED OAK.

The plants of this species on Catalina present far more variation in habit and leaf form than any that we have met with on the mainland. This species is a virulent poison, by contact, at any season of the year, to persons susceptible to poisoning by "Poison Ivy" growing in this or other parts of America.

A case of poisoning from smelling of the crushed leaves in January, came under the notice of the senior author while working on the island: the face became suffused; great heat and irritation accompanied by restlessness and irritability followed; extensive water blisters formed and large patches of excoriation resulted. These were followed by exfoliation. The best remedy proved to be the keeping of the affected parts moist with a solution of hyposulphite of soda.

2. NEOSTYPHONIA Shafer.

Shrubs or small trees, with simple toothed or entire coriaceous persistent leaves. Flowers on bracted pedicels in short dense racemes

closely paniculate at the ends of the branches. Calyx deeply 5-cleft, the lobes rounded, concave. Petals and stamens 5. Ovary 1-ovuled. Fruit densely pubescent and viscid, acid, the exocarp persistent; stone smooth, strongly compressed.

Inflorescence cinereous, leaves obtuse.
Inflorescence glabrate, leaves acute.

1. *integrifolia*.
2. *ovata*.

1. **N. integrifolia** (Nutt.) Shafer, Britt. & Shaf. N. A. Trees 612 (1908).

Styphonia integrifolia Nutt. T. & Gr. Fl. N. A. 1:220 (1838).

Rhus integrifolia B. & H., Wats. Wheeler Rep. 84 (1878).

Low evergreen shrub, 1-2 m. high, often more or less depressed, with short stiff branches; leaves mostly single sometimes a few ternate, oval, rigid-coriaceous, very obtuse at both ends, or acutish at base, entire or sometimes serrate, 2.5-4 cm. long, dark green and shining above, veiny and paler beneath; petioles 5-8 mm. long; inflorescence and young parts cinereous or canescently puberulent; flowers white or rose-colored, glomerate, sessile, subtended by rather thick orbicular bracts within which are 2 similar but thinner bractlets; sepals oval-orbicular, scarious-margined, ciliolate; drupes very viscid and acid, about 10 mm. in diameter.

Common on all hillside slopes. January to July. Near the Isthmus, Lyon 55; Avalon vicinity, Trask, "Twenty to twenty-five feet high with trunk a foot in diameter", Brandegee, Nuttall 13, Hall 8288; Eastwood 6449; Dall & Baker; Pebble Beach Canyon, Smith 5116, Millsp. 4915; Knopf 10, 14, 311; Hamilton Canyon, Millsp. 4533; Cherry Canyon, Smith 5090; Swain's Canyon, Jepson 3054; Cherry Valley, Millsp. 4800. SOUR OAK, SOUR BERRY, SUMACH.

A cooling drink is made from the ripe fruits, called by the Mexicans LIMONADE.

2. **N. ovata** (Wats.) Abrams, Bull. N. Y. Bot. Gard. 6:403 (1910).
Rhus ovata Wats. Proc. Am. Acad. 20:358 (1885).

Erect or spreading evergreen shrub, 1.5-3 m. high; leaves rigid-coriaceous, very smooth and shining, ovate or subcordate, acute at apex, entire or sharply serrate, some few leaves ternate; inflorescence glabrous or glabrate; bracts as in the last; calyx scarcely or not at all ciliolate; fruit 8 mm. in diameter, otherwise as in the last.

Rocky canyons, never common. March to May. Mrs. Trask says: "Abundant in three of the largest canyons. It has a clear trunk and bushy head like an orchard tree"; Rusby; Silver Canyon, Nuttall 281. SUGAR BUSH, SUMACH.

3. **MALOSMA** Nutt.

Arborescent shrubs with simple coriaceous persistent leaves and small flowers in ample terminal panicles. Calyx 5-cleft. Petals and stamens 5. Ovary 1-ovuled. Fruit small, with a smooth whitish

exocarp, beaked by the persistent styles; stone nearly smooth, thickened and rugose along one edge.

1. *M. laurina* Nutt. Engl. DC. Monogr. 4:393 (1883).

Rhus laurina Nutt. T. & Gr. Fl. N. A. 1:219 (1838).

Erect evergreen shrub or tree, 2-4 m. high, exhaling the odor of bitter almonds; leaves thin, coriaceous, oblong-lanceolate, entire, acute or obtuse, mucronate, 7-10 cm. long, rounded at base, on rather long petioles; flowers polygamous, very small, white, numerous, in ample terminal panicles; drupes whitish, 2-3 mm. in diameter. smooth; mesocarp waxy; stone minute, smooth.

Common on hillsides and canyons, sometimes with a trunk up to a foot in diameter. Often a few leaves show a tendency toward ternation. June to July. Lyon; Avalon vicinity, Trask, Brandegee, Smith 4988, 5164; Eastwood 6484; Hasse; Jepson 3049, Reed 2828, Pendleton 1434, Nuttall 309, 1157; Pebble Beach and Banning's Canyon, Knopf 164, 238. LAUREL SUMACH.

[*Schinus molle* Linn., the CALIFORNIA PEPPERTREE, is grown in a few places near Avalon (Nuttall 150), but it has shown no tendency to become naturalized so far as we have observed.]

Order 12. RHAMNALES.

Shrubs, vines, or small trees, with nearly always alternate leaves. Flowers small, regular. Sepals mostly more or less united. Petals distinct or wanting. Stamens as many as the sepals or calyx-lobes and alternate with them, opposite the petals when these are present. Ovary compound, superior; ovules erect.

Shrubs or trees, fruit a drupe or capsule.
Vines, fruit a berry.

1. RHAMNACEAE.
2. VITACEAE.

Family 1. RHAMNACEÆ.

BUCKTHORN FAMILY

Erect or climbing shrubs, or small trees, often thorny. Leaves simple, stipulate, mainly alternate, often 3-5-nerved. Stipules small, deciduous. Inflorescence commonly of cymes or panicles. Flowers small, regular, perfect or polygamous. Calyx-limb 4-5-toothed or 4-5-lobed. Petals 4-5, inserted on the calyx, or none. Stamens 4-5, inserted with the petals and opposite them; anthers short, versatile. Disk fleshy. Ovary sessile, free from or immersed in the disk, 2-5- (often 3-) celled; ovules 1 or 2 in each cavity, anatropous. Fruit often 3-celled. Seeds solitary in the cavities, erect; endosperm fleshy, rarely none; embryo large; cotyledons flat.

Ovary free from the disk, fruit a drupe.
Ovary adnate to the disk at base, fruit dry.

1. RHAMNUS.
2. Ceanothus.

1. RHAMNUS Linn.

Shrubs or small trees, with pinnately veined and (in our species) deciduous leaves, and small axillary cymose racemose or paniculate, perfect or polygamous flowers. Calyx-tube urceolate, its limb 4-5-toothed. Petals 4 or 5, mainly emarginate and hooded, or none. Disk free from the 3-4-celled ovary. Style 3-4-cleft. Drupe berry-like, containing 2-4 nutlet-like stones. Seeds mainly obovoid; endosperm fleshy.

1. *R. insulus* Kell. Proc. Calif. Acad. 2:20 (1863).

R. insularis Greene, Bull. Calif. Acad. 2: 392 (1887).

Spineless shrub, or tree up to 6 m. high with a trunk up to 3 dm. diameter. Leaves ovate or ovate-lanceolate, stiffish, evergreen 2-5 x 1.5-3.5 cm. abrupt or narrowing at the base, obtusish or pointed, mucronate, regularly but slightly serrate with minute papillate teeth, smooth above, slightly crispid on the larger veins more or less reticulate-veined beneath. Inflorescence in dense or somewhat open clusters in the upper axils or scattered on the internodes; pedicels crisp-hairy, variable in length; calyx-tube about the length of the triangular, pointed lobes. Fruit obovate, blackish-red, always 2-seeded; peduncles about twice the length of the petioles.

Very variable, no two collections among many, exactly alike. The island specimens differ greatly in leaf-size and somewhat in outline and pubescence quite evidently due to age, available moisture and season. They intergrade so completely that they cannot be considered as more than races of one species. None approaches either *R. crocea* or *R. ilicifolia* in important characters.

Moister canyon slopes and bottoms common. February to May. Lyon; Trask (labelled *R. crocea pyrifolia* in Herb. N. Y.); Brandegee (*R. crocea* in Herb. Gray); Towney (*R. pyrifolia* in Herb. N. Y.); Swain's Canyon, Hall 8270; Jepson 3042; Grant 3771 (Insular var. of *R. ilicifolia*=*R. pyrifolia* in Herb. N. Y., *R. ilicifolia* in Herb. U. S.); Rusby alt. 1800 feet (*R. pyrifolia* in Herb. N. Y.); Gallagher's Canyon, Eastwood 6469 (*R. catalinae* in Herb. Gray and N. Y.); East End and Summit Road, Smith 5120, 5026; Avalon Valley, Millsp. 4772; Banning's Canyon, Mountain above Big Wash Canyon, Beacon Str. Canyon and Schoolhouse Ridge, Nuttall 331, 332, 726, 784, 12; Summit of Upper Road to Pebble Beach and in White's Valley, Knopf 167, 51; Cape Canyon, Millsp. 4672; Middle Ranch Canyon, Nuttall 655, Knopf 262, 370; Hamilton Canyon, Nuttall 229; Rock Spring Canyon, Knopf 368. ISLAND BUCKTHORN, WILD COFFEE.

2. CEANOTHUS Linn.

Shrubs, with petioled leaves and cymose panicles of small perfect flowers. Calyx-limb 5-lobed. Petals 5, hooded, clawed, longer than the calyx-lobes, inserted under the disk. Stamens 5; filaments filiform, elongated. Ovary immersed in the disk and adnate to it at the base, 3-lobed. Disk adnate to the calyx. Style short, 3-cleft. Fruit dry, 3-lobed, separating at maturity into 3 nutlets. Seed-coat smooth; endosperm fleshy; cotyledons oval or obovate.

- | | |
|---|------------------|
| Inflorescence thyrsoïd, leaves large, pointed. | 1. arboreus. |
| Inflorescence clustered, leaves small, blunt: | |
| Sepals ovate, pointed; filaments ligulate. | 2. crassifolius. |
| Sepals oblong-ovate, blunt, filaments filiform. | 3. megacarpus. |

1. **C. arboreus** Greene Bull. Cal. Acad. 2:144 (1886).

A small tree, 4.5-7.6 m. high, trunk 1.5-2.5 dm. in diameter, smooth, with a light-gray bark; branches soft-pubescent; leaves ovate, acute, serrate, or often rather crenate, 5-10 cm. long, green and puberulent above, whitish and soft-tomentose beneath: flowers pale blue or white in a compound raceme: fruit not crested.

The largest known species, with more ample foliage than is found in any other; always tree-like in shape, with clean trunk and open but round head, like a well-kept orchard tree; in this particular most unlike any other *Ceanothus*.

Moister canyon slopes. February to March. *Lyon 2 (C. soledadensis); Trask* ("It blooms, in wet seasons in January, and sometimes produces its black fruits twice a year. A white-flowered bush blooms white year after year"); *Brandegee; Grant 1588; Grant & Wheeler 148/6146; McClatchie*; at the "Wishbone", *Smith 5019, 5167; Millsp. 4531; Descanso Canyon, Millsp. 4608, Nuttall 180, 181, 695; Pebble Beach Canyon, Nuttall 358, Knopf 18, 19, 330, 331; below base of Black Jack, Knopf 46, 127; Johnson's Landing, Nuttall 905; Big Wash Canyon, Knopf 363; Banning's Canyon, Jepson 3062; LILAC, TREE MYRTLE.*

2. **C. crassifolius** Torr. Pac. R. R. Rept. 4:75 (1857).

Erect, 1-3 m. high, the young branchlets white with a villous tomentum: leaves ovate-oblong, 12.7-20.6 mm. long, obtuse or retuse, more or less tomentose beneath, rarely entire and revolutely margined: petioles stout: flowers light blue or white, in dense very shortly peduncled clusters; sepals ovate, pointed, spreading; filaments ligulate.

On the dry slopes of canyons. January to April. *Avalon Canyon, Brandegee, McClatchie, Millsp. 4561; Pebble Beach Canyon, Knopf 144; South End, Nuttall 264; White's Landing, Millsp. 4590; Knopf 94; Cape Canyon, Millsp. 4670, 4675; Summit Trail, Smith 5031; Pacific Slope of the Salta Verde, Knopf 369. WHITE LILAC.*

3. **C. megacarpus** Nutt. N. A. Sylv. 1:194 (1865).

Ceanothus macrocarpus Nutt. in T. & Gr. Fl. N. A. 1:267 (1835) non Cav.

Branchlets canescent with a rusty-colored pubescence; leaves alternate, rather crowded, sometimes a little fascicled in the axils, thick and coriaceous, obovate-cuneate, entire, often emarginate, glabrous above, whitish and minutely tomentose-canescens beneath: flowers in lateral pedunculate nearly simple umbels, petals oblong-ovate, bluntish, inflexed; filaments filiform; fruit very large, with three projecting horn-like appendages at the summit.

Dry canyon slopes. January to March. *Trask; Brandegee, Hall 8271; Avalon Valley beyond Chicken Johnny's; top of Mount Wilson; Swain's Canyon, Nuttall 140, 340, 631. Similar in general appearance, but not so common as the last. WHITE LILAC.*

Family 2. **VITACEÆ.**

GRAPE FAMILY

Climbing vines or erect shrubs, with copious watery sap, nodose joints, alternate petioled leaves, and small regular greenish perfect or polygamo-dioecious flowers in panicles, racemes or cymes. Calyx entire, or 4-5-toothed. Petals 4-5, separate or coherent, valvate, caducous. Filaments subulate, inserted at the base of the disk or between its lobes; disk sometimes obsolete or wanting; anthers 2-celled. Ovary 1, generally immersed in the disk, 2-6-celled; ovules 1-2 in each cavity, ascending, anatropous. Fruit a 1-6-celled berry (commonly 2-celled). Seeds erect; testa bony; raphe generally distinct; endosperm cartilaginous; embryo short.

1. **VITIS** Linn.

Woody vines, rarely shrubby, mostly with tendrils. Leaves simple, usually palmately lobed or dentate. Stipules mainly small, caducous. Flowers mostly dioecious, or polygamo-dioecious, rarely perfect. Petals hypogynous or perigynous, coherent in a cap and deciduous without expanding. Disk annular or cup-shaped. Ovary 2-celled, rarely 3-4-celled; style very short, conic; ovules 2 in each cavity. Berry globose or ovoid, few-seeded, pulpy, edible in most species.

1. **V. Girdiana** Munson Proc. Soc. Prom. Agr. Sci. 1887: 59 (1887). Plate XIV, f. 1.

Strong climbing vine with thick diaphragms; leaves 15 cm. broad or less, broadly cordate-ovate, with a rather deep and narrow sinus, obscurely 3-lobed, and with many small and acute teeth, closely ash-tomentose beneath; flower clusters large, very compound; berries small, black, slightly glaucous; seeds pyriform.

Near canyon streams. July. Rare. Found in two localities only. *Mrs. Trask* says: "In one canyon only, climbing over *Populus*." This locality was re-discovered by *Knopf* (228), it is in Cottonwood Canyon about 200 feet up from the Coach Road crossing, the "Poplar" which it covers is now (1921) dead. (*Mrs. Trask's* collection was in 1902.) Pebble Beach Canyon, right hand branch, covering an area of about 100 x 200 feet, the largest vine 3 inches in diameter, *Nuttall*, *Knopf* 33, 177. Brandegee reports it as *V. californica*. WILD GRAPE.

Order 13. **MALVALES.**

Herbs, shrubs or trees, with simple, mostly alternate leaves. Flowers regular, usually perfect. Sepals separate, or more or less

united, valvate. Petals separate, very rarely wanting. Stamens usually numerous. Ovary superior, compound, the placenta united in its axis. Disk inconspicuous or none.

Family I. MALVACEÆ.

MALLOW FAMILY

Herbs or shrubs (sometimes trees in tropical regions), with alternate leaves. Stipules small, deciduous. Flowers regular, usually perfect, often large. Sepals 5 (rarely 3 or 4), more or less united, usually valvate; calyx often bracted at the base. Petals 5, hypogynous, convolute. Stamens ∞ , hypogynous, forming a central column around the pistil, united with the bases of the petals; anthers 1-celled. Ovary several-celled; styles united below, distinct above and generally projecting beyond the stamen-column, mostly as many as the cavities of the ovary. Fruit capsular (rarely a berry), several-celled, the carpels falling away entire or else loculicidally dehiscent. Seeds reniform, globose or obovoid; embryo curved; cotyledons large, plicate or conduplicate.

Stigmas linear:

Fruit axis exceeding the carpels.

Fruit axis shorter than the carpels.

Stigmas capitate or truncate.

1. LAVATERA.

2. MALVA.

3. MALVASTRUM.

1. LAVATERA Linn.

Involucel 3-6-cleft. Staminal column divided above into numerous filaments. Styles filiform, stigmatic on the inner side. Fruit depressed; the several carpels separating from the prominent more or less dilated axis, indehiscent, 1-seeded; seed ascending. — Leaves angled or lobed; flowers axillary or in terminal racemes; our species stout and shrubby.

1. *L. assurgentiflora* Kell. Proc. Calif. Acad. 1: 14 (1854). Plate VIII, f. 1.

Savintonia reticulata Greene, Leaflets 2: 161 (1911).

Tree, 18-45 dm. high, with slender flexuous branches, glabrous or sparingly stellate-pubescent: leaves cordate, angularly 5-7-lobed, 7.6-15.3 cm. broad, on long petioles, the lobes acute, coarsely toothed or lobed: flowers 1 to 4 in the axils, on slender deflexed and curved pedicels: involucel persistent, 6.3 mm. long, half the length of the campanulate densely pubescent calyx: petals purple, 2.6-3.8 cm. long, with a broad truncate limb and long narrow glabrous claws, having a

pair of dense hairy tufts at base: staminal column glabrous: styles exserted; fruit 12.7 mm. broad, the 6 to 8 carpels not beaked, somewhat appressed-hairy, 4.2 mm. or more in diameter, about equalling the low-conical summit of the axis.

Arid situations. January to December. The only Catalina locality known for this species is Bird Rock** whereon there are many individuals. *Trask**, *Brandegee*, *Millsp.* 4631, *Knopf* 259. From here it has been transplanted to the Banning House grounds at the Isthmus (*Millsp.* 4631a) and to several places in Avalon. A fine clump grows at the junction of Crescent Avenue and Pebble Beach Road (*Millsp.* 4633, *Nuttall* 685), and another may be seen on the crest of the hill just back of Windle's Printing Office. The species is not otherwise known except on Anacapa Island off the coast at Santa Barbara, the type locality. TREE MALLOW, MALVA ROSA, FLOWERING MAPLE.

Dr. Greene (Leaflet 2:160) describes a number of species from various Californian coast and island localities, in each of which the plants are known to have been transplanted either from Anacapa or Bird Rock. *Savinsonia* Webb. is not tenable. It is *Olbia* Medic. if distinct.

As to the possibility of this species having been brought from Spain see *Brandegee's* remarks *Zoe* Vol. 1, p. 133, 188; and *Parish's* on p. 300. See also Dr. *Greene's* remarks in *Garden & Forest* 3, p. 378; and *Baker's* in *Jour. Bot.* 28, p. 210.

2. MALVA Linn.

Pubescent or glabrate herbs, with dentate lobed or dissected leaves, and axillary or terminal solitary or clustered flowers. Calyx 5-cleft. Bractlets of the involuclers 3 (rarely none). Petals 5. Cavities of the ovary several or numerous, 1-ovuled; style-branches of the same number, linear, stigmatic along the inner side. Carpels arranged in a circle, beakless, indehiscent. Seed ascending.

1. *M. parviflora* Linn. *Amoen. Acad.* 3:416 (1756).

Widely branching 4.9-9.1 dm. high; petioles and ascending branches stellate-hairy on the upper side, glabrous below; leaves roundish in outline, with a red spot at base of blade, shallowly 7-lobed, 12.7 cm. broad or less, on petioles twice as long as the blade; flowers in rather close axillary clusters; bractlets linear; corolla pinkish with notched petals, 5.3 mm. long, slightly longer than the calyx; calyx commonly spreading under or about the mature fruit; carpels about 11, glabrous, sharply rugose-reticulate and pubescent on the back, the margin winged and denticulate.

Waste places and valley bottoms. January to August. In moist, shady places we have seen it fully 6 feet high. *Trask* (as *M. pusilla*); *Brandegee* (as *M. borealis*); Avalon, *Carlson*, *Millsp.* 4770; Isthmus, *Macbride & Payson* 868, *Millsp.* 4626, 4831. This was one of the four species of plants growing on Bird Rock in 1920. CHEESES.

*Mrs. Trask remarks on this species in *Erythea* Vol. 7, p. 140. See also *Brandegee*, *Zoe* 1:109.

**Lyon says (*Bot. Gaz.* 11:204): "Bird Island, a rugged, rocky islet not two miles distant (from Catalina), carries it in some profusion." This islet has had no vegetation upon it within the memory of the oldest local fishermen. Lyon must have intended to refer to Bird Rock, not a quarter mile out from Fisherman's Cove at the Isthmus.

3. MALVASTRUM Gray.

Herbs, with entire cordate or divided leaves, and solitary or racemose, short-pedicelled perfect flowers. Calyx 5-cleft. Bractlets of the involucler small, 1-3 or none. Cavities of the ovary 5-∞, 1-ovuled. Style-branches of the same number, stigmatic at the summit only, forming capitate stigmas; carpels indehiscent or imperfectly 2-valved, falling away from the axis at maturity, their apices pointed or beaked. Seed ascending.

1. **M. fasciculatum** (Nutt.) Greene, Fl. Francisc. 108 (1891).

Malva fasciculata Nutt. T. & Gr. Fl. 1:225 (1838).

Malvastrum Thurberi Gray Pl. Thurb. 307 (1854).

Stems 1-3 m. high, with the woody base often 2.6 cm. or more thick: pubescence stellate, all very short and close, almost scurfy: leaves roundish, mostly subcordate, crenate, obscurely 3-5-lobed or some 3-cleft, 2.6 or 5 cm. in diameter, some larger: flowers in sessile or short-peduncled clusters, spicately or sometimes paniculately disposed on virgate nearly naked branches, "fragrant"*; calyx-lobes broadly ovate, obtuse and with or without a short point: petals about 12-13 mm. long, rose-purple: carpels obovate-oval.

Open dry fields and in arroyos. January to May. In the Catalina specimens the stellate pubescence is greatly varied as to density; often scattered or almost wanting on the upper surface of the leaves. At the Isthmus, *Lyon & Nevin*, *Lyon*, *Trask*, *Millsp.* 4621; Avalon Valley, *Eastwood* 6442, *Smith* 5000, *Nuttall* 122, *Brandegee*; Cape Canyon, tree-like, 3 m. high, trunk 10 cm. in diameter, *Millsp.* 4671; White's Landing, *Millsp.* 4585, *Knopf* 145. TREE MALLOW.

Order 14. HYPERICALES.

Herbs, shrubs, or some tropical types trees, the flowers mostly complete, perfect and regular (irregular in Violaceæ). Sepals distinct, or more or less united, imbricated or convolute. Petals almost always present and distinct. Stamens usually numerous. Ovary compound, superior (inferior in Loasaceæ); placentæ mostly parietal.

Sepals distinct:

Flowers irregular, ovules anatropous.

Flowers regular, ovules orthotropous.

Sepals united.

1. VIOLACEÆ.

2. CISTACEÆ.

3. FRANKENIACEÆ.

Family 1. VIOLACEÆ.

VIOLET FAMILY

Herbs, shrubs, or rarely trees, with basal or alternate, simple, lobed or entire stipulate leaves and solitary or clustered, perfect, mostly irregular flowers. Sepals 5. Petals 5, hypogynous, imbricated

*The fragrance is that of fenugreek and often very pronounced.—C. F. M.

in the bud, the lower one larger or with a posterior spur. Stamens 5; anthers erect, connivent or syngenesious. Ovary simple, 1-celled, with 3 parietal placentæ. Fruit usually a loculicidal capsule. Seeds anatropous.

1. **VIOLA** Linn.

Acaulescent and scapose or leafy-stemmed herbs, the flowers solitary or rarely 2; early flowers petaliferous, often sterile, usually succeeded by apetalous or cleistogamous flowers which are abundantly fertile. Petals spreading, the lowermost one spurred or saccate; stamens 5, the two inferior ones spurred. Capsule 3-valved, elastically dehiscent.

1. **V. pedunculata** T. & Gr. Fl. N. A. 1: 141 (1838).

Stems 5-15 cm. long, prostrate or ascending, puberulent or nearly glabrous; leaves rhombic-cordate, usually almost truncate at the broad base, obtuse, coarsely crenate; stipules foliaceous, narrowly lanceolate, entire or incised; peduncles erect, much exceeding the leaves, 10-20 cm. long; conspicuously bibracteolate; flowers 2 cm. broad or more, yellow, the upper petal dark brown without, the others purple-veined within, the lateral ones bearded.

Moister grassy slopes of low altitudes. February to May. Avalon, slope above Lover's Cove, *Trask*, *Brandegge*, *Millsp.* 4636, *Nuttall* 118, *Knopf* 71; north slope of ridge between Rock Spring and Rock Falls Canyon, *Millsp.* 4711; ridge at head of Descanso Canyon, *Moxley* 749. YELLOW VIOLET, YELLOW PANSY, CALIFORNIA VIOLET.

Family 2. **CISTACEÆ.**

ROCK-ROSE FAMILY

Shrubs or low woody herbs, with simple leaves, and solitary racemose or paniculate flowers. Flowers regular, generally perfect. Sepals 3-5, persistent, when 5 the 2 exterior ones smaller, the 3 inner convolute. Petals 5 or 3, or wanting, fugacious or persistent. Stamens ∞ , hypogynous. Ovary 1, sessile, 1-several-celled; ovules orthotropous, stalked; style simple. Capsule dehiscent by valves. Seeds several or numerous; embryo slender; endosperm starchy or fleshy.

1. **CROCANTHEMUM** Spach.

Woody herbs or low shrubs, more or less branching, with showy yellow flowers, and with other much smaller apetalous cleistogamous ones. Petals in the larger flowers large, fugacious, the stamens

numerous. Placentæ or false septa 3. Ovules 2 on each placenta; style short; stigma capitate or 3-lobed; capsule 1-celled; seeds with long funicles; embryo curved.

1. **C. scoparium** (Nutt.) Millsp: *comb. nov.*

Helianthemum scoparium Nutt. T. & Gr. Fl. 1:152 (1838).

Stems tufted, slender, somewhat woody below, sparsely stellate-pubescent, 2.5-3.5 dm. high; leaves few, narrowly linear, 8-20 mm. long; flowers on slender pedicels, solitary or cymose at the ends of the branches; sepals 6 mm. long, acuminate, the 2 outer linear and much shorter; petals 6-8 mm. long; stamens about 20; capsule equaling the calyx.

Dry hillsides and ridges. February to April. *Lyon; Brandegee list*; only known to us from one locality: a dry plateau about half way up to the Pacific Ridge south of Avalon, *Millsp. 4656, Nuttall 154*. ROCK ROSE.

Family 3. **FRANKENIACEÆ.**

FRANKENIA FAMILY

Sepals 5, united in a furrowed tube, persistent, equal. Petals alternate with the sepals, hypogynous, unguiculate, with appendages at the base of the limb. Stamens hypogynous, either equal in number to the petals and alternate with them, or having a tendency to double the number; anthers roundish, versatile. Ovary 1-celled with 2-3 parietal placentæ: styles 2-3, filiform, united for a considerable part of their length. Capsule 1-celled, enclosed in the calyx, 2-3- or 4-valved, many-seeded. Seeds attached to the margins of the valves, very minute, anatropous. Embryo straight, erect in the midst of albumen. — Herbaceous plants or under-shrubs. Stems very much branched. Leaves opposite, exstipulate, with a membranous sheathing base, often revolute at the edge. Flowers sessile in the divisions of the branches, and terminal, embosomed in leaves, usually pink.

1. **FRANKENIA** Linn.

Styles 3, united below, stigmatose along the inner surface. Capsule loculicidal, many-seeded.

1. **F. grandiflora** C. & S. *Linnæa* 1: 35 (1826).

Leaves obovate-cuneiform, mucronulate, with revolute margins, rather coriaceous, very minutely hairy and ciliate particularly at the base; stems prostrate; branches and calyx minutely hairy.

Sea shores and borders of saline ponds. May to August. *Brandegee*; Catalina Harbor, *Lyon, Trask, Millsp.* 4788, *Nuttall* 1216; Little Harbor, *Nuttall* 762; Pebble Beach, *Pendleton* 1350, *Nuttall* 597. FRANKENIA.

Order 15. LOASALES.

Herbs, often armed with hooked stinging or viscid hairs, with estipulate leaves, and regular perfect white, yellow or reddish flowers. Calyx-tube adnate to the ovary, its limb 4-5-lobed, persistent. Petals 4 or 5, inserted on the throat of the calyx. Stamens ∞ , inserted with the petals; filaments filiform, commonly arranged in clusters opposite the petals; anthers introrse. Ovary 1-celled (rarely 2-3-celled), with 2-3 parietal placentæ; ovules anatropous. Capsule usually 1-celled, crowned with the calyx-limb. Seeds mostly numerous; endosperm scanty.

Family 1. LOASACEÆ.

LOASA FAMILY

Characters of the order.

1. ACROLASIA Presl.

Calyx 5-parted, persistent. Petals 5, short clawed inserted on the calyx. Stamens 10, fertile; filaments filiform, free, the exterior 5 longest; anthers subglobose. Ovary cylindrical; style filiform, trigonous 3-fid at the base; stigma obtuse. Capsule cylindrical, crowned by the calyx, 1-celled, 3-valved at apex, oligospermons; seeds 5-6, angular, rugose. Most species are small-flowered and have linear, lanceolate, or ovate-lanceolate, laciniate, dentate or more rarely entire, sessile leaves.

Leaves broadly lanceolate, sepals lanceo-subulate.	1. <i>micrantha</i> .
Leaves narrowly lanceolate, sepals subulate.	2. <i>gracilentia</i> .
Leaves cordate-ovate, sepals ovate-triangular.	3. <i>catalinensis</i> .

1. **A. micrantha** (T. & Gr.) Rydb. Bull. Torr. Club. 30:278 (1903).
Mentzelia micrantha T. & Gr. Fl. 1:535 (1840).

Hispid throughout with short hairs; stem erect, dichotomous, whitish; leaves ovate, acuminate, cuneate at the base, sessile, sinuate-pinnatifid; flowers glomerate, shorter than the floral leaf, ebracteolate; petals 5, ovate, exceeding the calyx-segments; stamens 15-20; five of the filaments petaloid and emarginate at the apex; capsules oblong-cylindrical, 3-seeded, 3-valved at the summit; style slightly spirally twisted.

Dry rocky cliff detritus, June. *Brandegee, list; Trask; vicinity of Avalon, Hall 8286, Smith 5054, Nuttall 267; Gallagher's Canyon, Eastwood 6478.*

2. *A. gracilentia* (T. & Gr.) Rydb. *idem.*

Mentzelia gracilentia T. & Gr. *ibid.* 534.

Stem pubescent; leaves lanceolate-linear, sessile, muricate-scarious, pinnatifid, the lobes short, obtuse, mostly entire; bracteoles at the base of the calyx pinnatifid; flowers clustered at the summit of the stem; petals cuneiform-obovate, obuse or retuse, more than twice the length of the ovate-lanceolate calyx-segments; filaments numerous (40 or more), filiform-subulate; ovary obconic; ovules 20 or more.

Dry situations. March to May. So far collected only by *Mrs. Trask*: "One locality with only a few plants, 1-6 inches high, with bright yellow flowers," distributed as *M. affinis*.

3. *A. catalinensis* Millsp. *sp. nov.*

Herba annua, celsa, caule pallens, ramis superioribus bifurcata, ramorum axillis extremitatisque foliata; partibus terminalibus pilis rectis, rigidis, vitreis, articulatis et circum articulos barbatis vestita; internodiis perspicuis. Folia principalia sessilia, ovata, cordata, acuta, ea ad basim ramorum amplexicaulia; margine hic illic late crenata; folia terminalia conferta, in jugis, cordata, petiolata, petiolis laminas plerumque æquantibus; inflorescentia solitaria, sessili, in foliorum axillis. Calyx elongato-tubuliformis, triangulatis, dentibus, 5, triangulatis, hebetibus, pilis acicularibus basi bullatis; petalis flavis, triangulato-ovatis, hebetibus, quam calyce circum duplo longioribus; filamentis staminum longiorum circum duplo longioribus quam antheris; stigmate compresso-clavato; seminibus triangulatis.

Dry talus of the high "break off" along Pebble Beach Road near Avalon. July 2, 1909. *R. L. Pendleton 1363. Type* in herb. Field.

Order 16. CACTALES.

Fleshy plants, with continuous or jointed stems, mostly leafless, or with small leaves, generally abundantly spiny, the spines developed from cushions of hairs or bristles (*areolae*). Flowers mostly solitary and sessile, perfect, regular, showy. Calyx-tube adnate to the ovary, its limb many-lobed. Petals numerous, imbricated in several rows, mostly distinct. Stamens numerous, inserted on the throat of the calyx. Filaments filiform; anthers small. Ovary 1-celled; ovules numerous, anatropous, borne on several parietal placentæ. Styles terminal, elongated; stigmas numerous. Fruit a berry, mostly fleshy, sometimes dry. Seeds smooth, or tubercled, the testa usually crustaceous or bony; endosperm little, or copious.

Family I. **CACTACEÆ**.*

CACTUS FAMILY

Characters of the order.

Areoles with glochids, flowers rotate.

Areoles without glochids, flowers tubular.

1. **OPUNTIA**.

2. **BERGEROCACTUS**.

I. **OPUNTIA** Mill.

Succulent plants, with jointed branching stems, the joints flat, or cylindric, and small, mostly subulate, deciduous leaves, the areolæ usually spine-bearing. Flowers usually lateral. Calyx-tube not prolonged beyond the ovary, its lobes spreading. Petals numerous, slightly united at the base. Stamens very numerous. Ovary cylindric, exserted; style cylindric, longer than the stamens; stigma 2-7-rayed. Berry globose to obovoid, often spiny.

Joints all terete.

Joints flat or compressed:

Spines brown, fruit purple.

Spines yellow, fruit yellow.

1. *prolifera*.

2. *occidentalis*.

3. *megacantha*.

1. **O. prolifera** Engelm. Am. Jour. Sci. 2, 14: 338 (1852).

Stems 1-2 m. high, the trunk and old branches terete and woody; terminal joints 3-12 cm. long, easily breaking off, fleshy, covered with short, more or less turgid tubercles; spines 6 to 12, brown, 10-12 mm. long; glochids pale; flowers small; sepals orbicular, obtuse, dark red; petals red; filaments yellow; style stout; stigma-lobes red; ovary 1 cm. long, strongly tuberculate; upper areoles bearing 2 to 6 reddish spines or the joints naked throughout; fruit proliferous, 3-3.5 cm. long and often without seeds; seeds if present, large, regular, 6 mm. broad.

Dry ridges. July to August. Only known from ridges between Middle Ranch and Little Harbor, where it is plentiful in a number of localities. *Mrs. Trask*; *Eastwood* saw it, but did not collect a specimen; *Brandege* list; on ridges between Middle Ranch and Cottonwood Canyon and between Cottonwood Canyon and Little Harbor, *Nuttall* 764, 765, *Knopf* 191. CHOLLA.

2. **O. occidentalis** Engelm. & Bigel. Proc. Am. Acad. 3: 291 (1856).

Opuntia Lindheimeri occidentalis Coult. Cont. U. S. Nat. Herb. 3: 421 (1896).

Erect or spreading, often 1 m. high or more, forming large thickets; joints large, obovate to oblong, 2-3 dm. long; areoles remote; spines 2-7, stout, unequal, the longest ones 4-5 cm. long, more or less flattened, brown or nearly white, sometimes wanting; shorter spines often white; glochids often prominent, brown; flowers

*Specific determinations by J. N. Rose.

yellow, large, including the ovary often 10-11 cm. long; fruit large, purple.

Open arid slopes and ridges everywhere. June to September. *Lyon*; *Trask*; *Brandege* (all as *Opuntia Engelmanni littoralis*); *Rusby*; *Smith 4976*; *Miller*; *Millsp. 4468, 4525*. TUNA, PRICKLY PEAR.

The deep-purple fruits are eaten raw (after first carefully removing the beard-like clusters of glochids by peeling); or used like gombo, in soups. The ripe "pears" also make a delicious fruit pudding.

3. **O. megacantha** Salm-Dyck, Hort. Dyck. 363 (1834). Plate VIII, f. 2.

Plant tall 4-5 m. high or more, with a more or less definite woody trunk; joints of large plants obovate to oblong, often oblique, sometimes 40-60 cm. long or more, but in greenhouse specimens often much smaller, pale dull green, slightly glaucous; leaves minute, often only 3 mm. long, green or purplish; areoles rather small, on large joints often 4-5 cm. apart, when young bearing brown wool; spines white, usually 1-5, slightly spreading, sometimes nearly porrect, usually only 2-3 cm. long, sometimes few and confined to the upper areoles; glochids few, yellow, caducous, sometimes appearing again on old joints; flowers yellow to orange, about 8 cm. broad; ovary spiny or spineless, obovoid; fruit yellow, 7-8 cm. long.

Dry exposed ridges. July to September. Becoming established in many localities on the island, *Millsp. 4523*, especially on Descanso and Hamilton Canyon slopes. It is readily distinguished by its large, yellow fruits. *Mr. Knopf* remarks that the first plants were transplanted by *Mr. Banning* at about the time the Eucalyptus trees were set out along the Coach Road. YELLOW TUNAS.

2. **BERGEROCACTUS** Britton & Rose.

Low, much branched cactus, with stout, cylindric, spreading or ascending branches; ribs many, low; areoles approximate; spines many, yellow, acicular; flower small, pale yellow, with short tube and widely expanded limb; scales on ovary and flower-tube small, bearing felt and spines in their axils; perianth-segments small, obtuse; fruit globose, densely spiny; seeds obovate.

1. **B. Emoryi** (Engelm.) Britton & Rose, Contr. U. S. Natl. Herb. 12:474 (erratum) (1909). Plate XIII, f. 2.
Cereus Emoryi Engelm. Am. Jour. Sci. 2, 14:338 (1852).

Branches 2-6 dm. long, 3-6 cm. in diameter, entirely covered with the dense spiny armament; ribs 20-25, very low, only a few millimeters high, somewhat tuberculate; spines 10-30, yellow to yellowish brown, acicular, 1-4 cm. long; flowers about 2 cm. long and about as broad when expanded; outer perianth-segments obovate, obtuse; inner perianth-segments oblong, about 1 cm. long.

Hanging over cliffs. July to September. *Mrs. Trask* says: "On two sea cliffs"; *Brandegee list*; near the Isthmus, *Pendleton 1424*, *Reed 2796*. SNAKE CACTUS. Shore Catalina Harbor near Ballast Point, *Knopf*.

Mrs. Trask says the Mexicans use the plant as an antifebrile (*Erythea* 7:145).

Order 17. MYRTALES.

Herbs, shrubs or trees, unarmed, sometimes aquatic or amphibious. Leaves alternate or opposite. Flowers regular or irregular, complete, and often showy, or reduced to a stamen and pistil adnate to the hypanthium. Hypanthium merely enclosing the ovary or adnate to it. Stamens few or many. Anthers opening by slits, valves or pores. Stigma terminating the style, or sessile. Fruit capsular or baccate, or resembling an achene.

Family VI. ONAGRACEÆ.

EVENING PRIMROSE FAMILY

Herbs, or rarely shrubs, with alternate or opposite leaves, no stipules or mere glands in their places, and generally perfect flowers. Calyx-tube adnate to the ovary, the limb 2-6-lobed (usually 4-lobed). Petals 2-9 (usually 4), convolute in the bud, rarely none. Stamens usually as many or twice as many as the petals. Ovary 1-6-celled (usually 4-celled); styles united; stigma capitate, discoid or 4-lobed; ovules generally anatropous. Fruit a capsule or small nut. Endosperm very little or none.

Seeds comose:

Flowers showy, scarlet.

Flowers small, white or roseate.

Seeds naked:

Anthers attached at or near their base.

Anthers versatile:

Stigma 4-lobed.

Stigma capitate.

1. ZAUSCHNERIA.

2. EPILOBIUM.

3. GODETIA.

4. SPHAEROSTIGMA.

5. EULOBUS.

I. ZAUSCHNERIA Presl.

Flowers in loose spikes terminating the branches, large, erect-spreading, with short foliaceous bracts; calyx and petals bright red. Tube of the calyx much produced beyond the ovary, from which it finally separates by an articulation, colored, infundibuliform, globose-inflated at the base; the segments spreading, much shorter than the tube. Petals 4, obcordate, or rather deeply 2-cleft, rather longer than the lobes of the calyx. Stamens 8, slightly exserted; the alternate ones

a little shorter: filaments filiform: anthers linear-oblong, fixed by the middle. Ovary 4-celled: style filiform, erect exserted: stigma capitate, 4-lobed. Capsule linear, short, 4-sided, imperfectly 4-celled, 4-valved. Seeds numerous, with a coma or tuft of long hairs at the chalaza.

1. *Z. californica* Presl. Rel. Haenk. 2:28 (1835).

More or less villous and often tomentose, much branched, the ascending or decumbent stems 3.3-6.8 dm. long: leaves narrowly lanceolate to ovate, 12.7 mm.-3.8 cm. long, acute, entire or denticulate: flowers 2-3.2 cm. long above the ovary; the calyx-lobes 8.4 mm. long: capsule attenuate to the slender base, 12.7-20.6 mm. long, sometimes shortly pedicellate.

The Catalina plants vary greatly in leaf size and pubescence, thus including var. *microphylla* and Greene's *Z. cana*, but never with the ovate or ovate-lanceolate leaves of the inland Californian species—*latifolia*. The variation, however, is quite evidently due to whether the plants grow in the dry open; with sheltering grasses; or where there is more or less permanent moisture; they must, therefore, be simply races of one species. Those flowers having villous calyx lobes are the last few of the blooming period.

Common on dry slopes and in canyon bottoms. June to November. *Lyon*; *Brandege*; *Trask*; *Grant* 1394; *Eastwood* 6452; *Macbride & Payson* 861; *Nuttall* 546, 660, 787, 792, 800, 837, 844, 1125, 1158, *Knopf* 157. BALSAM-MEA. Used as a vulnerary for fresh or old wounds and sores.

2. *EPILOBIUM* Linn.

Herbs, or sometimes shrubby plants, with alternate or opposite leaves, and solitary, spicate or racemose flowers. Calyx-tube prolonged beyond the ovary, the limb 4-parted, deciduous. Petals 4, often notched. Stamens 8; stigma club-shaped or 4-lobed. Capsule narrow, elongated, 4-sided, loculicidally dehiscent by 4 valves. Seeds with a tuft of hairs (coma) at the summit.

1. *E. holosericeum* Trelease, Rev. Epilob. 91 (1891).

Rather woody, loosely branched, at least the upper leaves and branches canescent with subappressed hairs; leaves 50 mm. long, rather remote and smaller on the flowering branches, oblong-lanceolate, obtuse or exceptionally acute, undulately low-serrulate, narrowed or abruptly contracted and then cuneately narrowed into short petioles; flowers produced in long succession along the elongated branches, erect, pale, barely 5 mm. long; fruiting peduncles about 10 mm. long and equalling the leaves; seeds short-beaked, very finely papillate, .4 x 1 mm.; coma white or somewhat dingy.

Canyon bottoms near more or less permanent water. July to August. *Trask*; "Canyons of Santa Catalina" *McClatchie*; right fork of Big Wash Canyon and in water of Middle Ranch Creek near Eagle's Nest, *Nuttall* 850. WILLOW HERB.

3. *GODETIA* Spach.

Annuals, simple or branched, erect; leaves alternate, denticulate or entire; flowers mostly showy, in usually leafy racemes or spikes. Calyx-tube above the ovary obconic or shortly funnellform, deciduous; lobes reflexed. Petals 4, broad and sessile, entire or emarginate or very rarely 2-lobed, lilac-purple or rose-colored. Stamens 8, unequal, the filaments opposite to the petals shortest; anthers perfect, oblong, attached at the base and erect or arcuate. Ovary 4-celled, many-ovuled; style filiform; stigma-lobes short, linear or roundish. Capsule ovate to linear, 4-sided, somewhat coriaceous, loculicidally dehiscent. Seeds ascending or horizontal, in 1 or 2 rows, obliquely angled, the upper surface with a thin tuberculate margin.

Flower buds erect, flowers purplish.
Flower buds nodding, flowers cream.

1. *quadrivulnera*.
2. *epilobioides*.

1. *G. quadrivulnera* Spach. Hist. Veg. Phan. 4:398 (1835).

Puberulent, ovary and capsule more or less villous; stem usually very slender, 3.3-6.8 dm. high; leaves linear to linear-lanceolate, sessile or attenuate to a short petiole, entire or slightly denticulate, 2.6-5.1 cm. long; calyx-tubes obconic, 4.2 (rarely 6) mm. long; petals deep purple or purplish, 6.3-12.7 mm. long; stigma-lobes short, purple; capsules 10.5-30 mm. long, usually short, attenuate at the apex, 2-costate at the alternate angles.

In moist places, June to July. *Lyon*; *Trask* (as *G. tenella*); *Brandege* (as *G. Bottae*); near the summit of the Equestrian Trail and on the banks of the creek in Middle Ranch Canyon, *Nuttall* 239, 302; Rock Spring Canyon and along upper road to Pebble Beach, *Knopf* 106, 170. *Jepson* (Univ. Calif. Publ. 2:340) makes four varieties and three forms in this species which on Catalina yields no two specimens exactly alike in minute characters or color.

2. *G. epilobioides* Wats. Proc. Am. Acad. 8:599 (1873).

Tomentosely puberulent, erect, 3.3-9.1 dm. high; leaves linear to linear-lanceolate, entire or sparingly denticulate, 2.6-5.1 cm. long, petioled; calyx-tube 2.1-4.2 mm. long; petals light purple or rose-colored, 6.3-12.9 mm. long; stigma-lobes short; capsules acuminate, attenuate to a short pedicel or rarely nearly sessile, 12.7-28.9 mm. long.

Moister canyon slopes. May to June. Vicinity of Avalon, *Trask* (as *G. tenella*); *Brandege*; Coach Road, Pebble Beach Road, Rock Spring Canyon, *Smith* 501-1, 5065, 5105; Descanso Canyon, *Moxley* 741; Piedra Escalera Canyon, *Nuttall* 687; northeast slope of Black Jack on ridge to Echo Lake, *Knopf* 96.

4. **SPHÆROSTIGMA** F. & M.

Annual or perennial herbs with erect branching or spreading stems, the bark often exfoliating and shiny. Leaves alternate, entire or dentate, petioled or sessile. Flowers solitary in the axils or in terminal spikes, usually yellow, rarely white or rose color, often with a brownish spot at the base, turning green or reddish in age. Stamens 8; anthers versatile, oblong. Style filiform; stigma capitate. Ovary 4-celled, usually linear, 4-angled, often contorted, membranous, sessile, dehiscent loculicidally. Seeds in 1 row in each cell.

Petals 8 mm. or more long.
Petals 3 mm. or less long.

1. *bistortum*.
2. *micranthum*.

1. **S. bistortum** (Nutt.) Walp. Rep. 2:77 (1843).
Oenothera bistorta Nutt. T. & Gr. Fl. 1:508 (1840).

Somewhat hirsute, stems decumbent, much branched from the base; radical leaves spatulate-linear, petioled; cauline ones lanceolate, mostly sessile, acute or acuminate, sharply denticulate; flowers (rather large) axillary; tube of the calyx infundibuliform, rather shorter than the segments; petals broadly obovate, entire, more than twice the length of the longer stamens; anthers oblong, fixed near the middle; style longer than the stamens; stigma large and thick; capsules acutely quadrangular, attenuate at the summit, somewhat pubescent or hirsute, spirally contorted or coiled.

Dry open places. May to June. *Lyon; Trask; Brandegee list*; field along the upper road to Pebble Beach, *Nuttall 112*. EVENING PRIMROSE.

2. **S. micranthum** (Hornem.) Walp. *idem*.
Oenothera micrantha Hornem. Hort. Hafn. 2:84 (1819).

Hirsute; stems ascending, flexuous; leaves linear-oblong, acutely denticulate, rather obtuse; the radical ones spatulate, petioled; flowers (very small) axillary; calyx hirsute; the tube obconic, about half the length of the linear-oblong segments; petals obovate, twice the length of the longer stamens; anthers roundish; capsules elongated, slender, acutely quadrangular, acute, hirsute with spreading hairs, much contorted.

Open dry or grassy places. March to May. *Lyon; Brandegee list*; Avalon Valley, *Smith 4997, Nuttall 136*; Schoolhouse Ridge, *Nuttall 33*; Pebble Beach and Gallagher's Canyon, *Mills 4866, 4885*. EVENING PRIMROSE, TWIST POD.

5. **EULOBUS** Nutt.

A rather large virgately branched annual herb, with fistulous stems. Leaves scattered; the lower ones oblong, unequally pinnately lobed; the upper linear, nearly sessile, few denticulate. Flowers (rather large) axillary along the virgate branches; petals white

changing to red, evanescent. Tube of the calyx scarcely produced beyond the ovary; limb 4-parted reflexed; the very short campanulate base invested with a thickened disk. Petals 4, rhombic-obovate. Stamens 8, inserted into the margin of the disk, shorter than the petals, the alternate ones much shorter; filaments filiform; anthers oblong, fixed below the middle, at length versatile; those of the shorter stamens roundish and much smaller, fixed by the middle. Ovary linear-filiform, 4-celled; style somewhat exceeding the longer stamens; stigma rather large, capitate. Capsule linear, very long and narrow, 4-sided, nearly sessile, straight, refracted, imperfectly 4-celled; the dissepiments very thin and narrow, adherent to the valves. Seeds very numerous, obovate-oblong, naked, erect.

1. **E. californicus** Nutt. T. & Gr. Fl. 1: 515 (1840).

Stem (about 6.8 dm. high) and branches thick, glabrous, with few scattered leaves. Calyx-segments lanceolate-linear; the extremely short tube lined with an orange-red disk. Petals about 12.7 mm. long, rather obtuse. Capsules 7.6 cm. or more in length, very narrow, obtusely quadrangular, strongly refracted; the valves somewhat membranaceous.

Open dry ridges and rocky slopes, rare. May to June. *Brandegee lists; Trask*, "in two localities only," one of which is Avalon Valley; open ridge leading from White's Landing to Echo Lake, *Knopf 147*.

[**Eucalyptus** sps.

Several species of *Eucalyptus* have been planted upon the island, principally in Avalon and its vicinity. The trees appear to have become well established in growth, but so far as we have observed, there is no indication of any of these species becoming naturalized through seedlings.]

Order 18. **AMMIALES.**

Herbs, shrubs or trees, almost always with petaliferous flowers. Calyx-segments and petals usually 5. Stamens 4 or 5. Ovary inferior, adnate to the calyx, compound; ovules 1 in each cavity.

Family 1. **AMMIACEÆ.**

(**UMBELLIFERÆ.**)

CARROT FAMILY

Herbs, with alternate compound or sometimes simple leaves, the petioles often dilated at the base. Stipules none, or rarely present and minute. Flowers small, generally in compound or simple umbels, rarely in heads or capitate clusters, often polygamous. Umbels and umbellets commonly involucrate or involucellate. Calyx-

tube adnate to the ovary, its margin truncate or 5-toothed, the teeth seldom conspicuous. Petals 5, inserted on the margin of the calyx, usually with an inflexed tip, often emarginate or 2-lobed, those of the outer flowers sometimes larger than those of the inner. Stamens 5, inserted on the epigynous disk; filaments filiform; anthers versatile. Ovary inferior, 2-celled; styles 2, filiform, persistent, often borne on a conic or depressed stylopodium; ovules 1 in each cavity, pendulous, anatropous. Fruit dry, composed of 2 carpels (mericarps), which generally separate from each other at maturity along the plane of their contiguous faces (the commissure). Fruit either flattened laterally (at right angles to the commissure), or dorsally (parallel to the commissure), or nearly terete (not flattened). Carpels after parting from each other supported on the summit of a slender axis (the carpophore), each with 5 primary ribs in their pericarps (rarely ribless), and in some genera with 4 additional secondary ones, the ribs or some of them often winged. Pericarp membranous or corky-thickened, usually containing oil-tubes between the ribs, or under the ribs and on the commissural sides, sometimes irregularly scattered, sometimes none. Seeds 1 in each carpel, usually adnate to the pericarp; seed-coat thin; endosperm cartilaginous; embryo small, placed near the hilum; cotyledons ovate, oblong or linear.

Fruits covered with hooked bristles.

Fruits with bristles on ribs only:

Bristles barbed at tip.

Bristles hooked.

Fruits not bristly:

Oil tubes distinct:

Stylopodium conical.

Stylopodium flat or wanting.

Oil tubes obscure or obsolete.

1. *SANICULA*.

2. *DAUCUS*.

3. *CAUCALIS*.

4. *FOENICULUM*.

5. *APIASTRUM*.

6. *BOWLESIA*.

I. *SANICULA* Linn.

Smooth perennials, with nearly naked stems; leaves palmately divided, the lobes more or less pinnatifid or incised; flowers unisexual, in irregularly compound few-rayed umbels, involucrate with sessile leafy usually toothed bracts, the bracts of the involuclers small and entire. Calyx-teeth somewhat foliaceous, persistent. Fruit subglobose or obovoid, densely covered with hooked prickles or tuberculate; ribs obsolete; oil-tubes numerous. Seeds hemispherical.

Fruits pediceled or stipitate.

Fruits sessile.

1. *Menziesii*.

2. *laciniata*.

1. **S. Menziesii** H. & A. Bot Beech. 142 (1841).

Stem solitary, erect, 3.3-8.4 dm. high, branching; leaves round-cordate, 5.1-7.6 cm. broad, very deeply 3-5-lobed; the broad lobes sharply toothed or somewhat cleft and the teeth tipped with slender bristles; upper leaves more narrowly lobed and laciniately toothed; umbels of 3 or 4 slender rays; involucre often small, of 2 or 3 narrow leaflets, the involucels of 6 to 8 lanceolate entire bracts 2-4.2 mm. long; sterile flowers nearly sessile; fruit 4 to 8 in each head, becoming distinctly pedicellate and divergent, obovate, 2 mm. long or more, covered with hooked prickles.

Gravelly banks. March to May. On the banks of the arroya of Rock Spring Canyon, *Trask*, *Mills* sp. 4891, *Nuttall* 249, 322; Rock Falls and Middle Ranch Canyons, *Nuttall* 351, 500. SANICLE.

2. **S. laciniata** H. & A. Bot. Beech. 347 (1841).

With the habit of *S. Menziesii*; leaves cordate or triangular, 3-parted, the divisions laciniately 1-2-pinnatifid and the segments laciniately toothed; the teeth spinosely pointed; flowers yellow; mature heads small, globose; the numerous fruit naked at base, hooked-bristly above.

All situations, common. January to May. *Dall & Baker*; *Trask*; *Brandege*; *Moxley* 689 (as *S. bipinnatifida*); *Mills* sp. 4535, 4841, *Nuttall* 110, 1079, 1153, 1212; *Knopf* 5, 15, 85, 122.

2. **DAUCUS** Linn.

Annual or biennial, setosely hispid; leaves pinnately compound with very small segments; involucral bracts foliaceous and divided, those of the involucels entire or 3-lobed; outer rays of the umbels often longest and connivent over the inner ones in fruit; flowers mostly white. Calyx 5-toothed. Disk and stylopodium mostly small and depressed. Fruit ovate or oblong, the carpels semiterete or somewhat dorsally flattened; primary ribs filiform and bristly, the intermediate more prominent and winged with a row of more or less united barbed prickles; oil-tubes solitary under the wings. Seed flat on the face or nearly so.

1. **D. pusillus** Michx. Fl. Bor. Am. 1:164 (1820).

Annual or biennial, erect, 3-7 dm. high, retrorsely hispid; leaves bipinnate, the segments pinnatifid, with short, narrowly linear lobes; rays 4.2-12.7 mm. long, nearly equal; involucre bipinnatifid, as long as the small umbel; involucels equalling the yellowish flowers; fruit 1-4.2 mm. long, shortly pedicellate, the prickles usually equalling or exceeding the width of the body; seed somewhat concave on the face.

Open, exposed, dry situations. April to June. *Brandege*; *Grant* 2376;

Pebble Beach Road, *Pendleton 1372*, *Smith 5051*, *Beckwith 6*; Avalon Valley, *Smith 4980*, *Nuttall 496*; Golf Links Canyon and Silver Canyon, *Nuttall 80, 497*; Descanso Canyon, *Moxley 752*. WILD CARROT, YERBA DEL VIBORA. It is considered a certain remedy for the bite of the rattlesnake. A poultice of the fresh leaves is applied to the wound with perfect confidence, by both the Mexicans and American residents of the island.

3. CAUCALIS Linn.

Annuals, mostly hispid; leaves dissected; umbels few-rayed, often opposite the leaves or sessile; flowers white or purplish. Calyx-teeth prominent. Stylopodium thick and conical. Fruit as in *Daucus*, but somewhat more laterally compressed, and the seed involute or deeply channelled.

1. *C. microcarpa* H. & A. Bot. Beech. 348 (1841).

Erect, slender, 15-28 cm. high, nearly glabrous; leaves much dissected, slightly hispid; umbels apparently sessile at the ends of the stem and branches, subtended by 2 or more foliaceous dissected bracts, 3-6-rayed; rays slender, 2.6-7.6 cm. long; umbellets few-flowered, with unequal pedicels; involucels of short entire bracts, rarely more foliaceous and divided; fruit oblong-oval, 4.2 mm. long, armed with rows of hooked prickles; seed deeply channelled.

Dry or even stony situations. April to May. *Lyon*; *Brandegee list*; Descanso Canyon, *Moxley 751*. RATTLESNAKE WEED. Much confidence is placed in this herb as a remedy for rattlesnake bites when applied as noted under *Daucus pusillus*.

4. FENICULUM Adans.

Erect glabrous herbs, with pinnately decompose leaves, the segments linear or capillary, and compound umbels of yellow flowers. Involucre and involucels none. Calyx-teeth obsolete. Stylopodium large, conic. Fruit linear-oblong, glabrous, terete, or nearly so. Carpels half-terete, dorsally flattened, prominently ribbed; oil-tubes solitary in the intervals. Seed-face flat, or slightly concave.

1. *F. Foeniculum* (L.) Karst. Deutsch. Fl. 837 (1882).

Anethum Foeniculum Linn. Sp. Pl. 263 (1753).

Foeniculum vulgare Gaertn. Fr. & Sem. 1:105 (1788).

Perennial, 6-12 dm. high. Leaves dissected into capillary segments; petioles broad, clasping; umbels large, 9-25-rayed, the rays rather stout, somewhat glaucous, 2-8 cm. long in fruit; pedicels 2-8 mm. long; fruit about 6 mm. long.

Moist waste places. July to December. Masses of this adventive weed grow in small gulches near Avalon (*Millsp. 4473*; *Nuttall 707*); Howland's (*Knopf 251*) and at Johnson's Landing (*Nuttall*). FENNEL.

As this species does not appear in the earlier collections from the island, it must have "come in" since about 1910.

5. **APIASTRUM** Nutt.

A smooth slender branching Californian annual; leaves dissected, with linear segments; umbels sessile, naked, few-rayed, in the forks or opposite to the leaves; flowers small, white. Calyx-teeth obsolete. Petals ovate, concave, obtuse. Stylopodium depressed; styles short. Fruit cordate in outline, laterally compressed with a narrow commissure; carpels incurved when mature, with 5 often obscure rugulose ribs; oil-tubes broad and solitary in the intervals, and a narrow one under each rib. Seed concave and somewhat incurved longitudinally. Carpophore 2-parted, rigid.

1. **A. angustifolium** Nutt. T. & Gr. Fl. 1:644 (1840).

Herb 22-44 cm. high; branches somewhat dichotomous; leaves 2.6-5.1 cm. long, biternately or triternately divided, with linear or nearly filiform segments; umbels and umbellets very unequally 3-4-rayed, the slender pedicels at length spinosely pointed with the persistent carpophore; fruit 1 mm. long, somewhat broader, variable in the curvature of the carpels and in the prominence of the ribs, which are sometimes nine, the primary and intermediate ones being nearly equally developed.

In sandy situations. March to April. *Mrs. Trask* says the plant is "common," but the only specimens we have seen are *Grant's* 2374, and *Knopf* 376 from the hillside above Moonstone Beach.

6. **BOWLESIA** R. & P.

Slender herbs, with scattered stellate pubescence; leaves opposite, simple, with scarious and lacerate stipules; flowers white, minute, in simple few-flowered umbels on axillary peduncles. Calyx-teeth rather prominent. Petals elliptical, obtusish. Fruit broadly ovate in outline, with a narrow commissure, turgid, becoming depressed on the back, without ribs or oil-tubes. Seed flat on the face, slightly hollowed on the back, not filling the calyx.

1. **B. septentrionalis** C. & R. Contr. U. S. Natl. Herb. 7:31 (1900).

Annual, weak and slender, thinly pubescent, the stems dichotomously branched, 3.3-6.8 dm. or more long; leaves thin, reniform to cordate, 1-4 cm. broad, shorter than the slender petioles, deeply 5-lobed, the acutish lobes entire or 1-2-toothed; peduncles much shorter than the petioles; the umbels 1-4-flowered; fruit 1 mm. long, sessile or nearly so, pubescent, the inflated calyx not adherent to the carpels, which are at first but partially occupied by the seed.

Moist, shady situations in narrow gulches. April to June. *Brandegee* list (as *B. lobata*); Cherry Valley, in dense shade of trees, *Mills* sp. 4806; in a "notch" at the sharp bend of the Equestrian Trail about half way up, *Nuttall* 595.

Family 2. **CORNACEÆ.**

DOGWOOD FAMILY

Trees or shrubs, rarely herbs, with simple and entire mainly opposite leaves, no stipules, and flowers in cymes (or capitate clusters) or spikes; the valvate petals and stamens 4 and epigynous in fertile flowers (the former sometimes wanting); calyx adnate to the 1-2-celled ovary, which becomes a 1-2-seeded drupe or berry in fruit. Seed suspended, anatropous, with a minute embryo in hard albumen.

1. **SVIDA** Opiz.

Shrubs or perennial herbs, rarely arborescent; leaves opposite, entire; flowers small, in dichotomous cymes, white, yellowish or greenish. Flowers perfect. Calyx minutely 4-toothed. Petals 4, oblong or ovate, valvate in the bud. Stamens 4, with slender filaments. Style slender; stigma capitate or truncate. Drupe ovoid or oblong, with a 2-celled 2-seeded stone. Cotyledons foliaceous.

1. **S. catalinensis** Millsp. *sp. nov.* Plate X, f. 1.

Frutex arborve circ. 6m. alta, caule 1.5-20 cm. crasso; ramis rubropurpureis, arcuatis vel etiam ad terram descendentibus ac demum profuse radicantibus, non pubescentibus nisi partibus nascentibus puberulentia levi subtili adpressaque vestitis. Petioli 4-5 mm. longi, laminis ovato-lanceolatis, 3.5-5 cm. longis x 1.5-3 cm. centiæ permoderate adpresso-puberulentæ, floribus paucis effectæ, latis, integris, apice obtusis, basi ad petiolum angustatis. Inflores- 2.5-3 cm. latæ; pedunculis circ. 2 cm., pedicellis 2.5 mm.; floribus ochroleucis, 9 mm. latis; calvcis tubulo 1 mm., dentibus calcarioideis 0.5 mm.; petalis 4, lanceolatis, carnosis, acutis, recurvatis; stigmatibus subcapitato. Fructus plumbeo-coloratus; centro ligneo paene globoso.

In more or less permanent water in canyon bottoms. May to June. Only three localities discovered. *Polley*; *Trask*; "in a short canyon east of Avalon," *Davidson* (as *Cornus pubescens californica*); "a single tree in Banning's Canyon", *Jepson* 3046; like a weeping willow, "in pools of standing water many branches droop straight down and strike root like a Banyan Tree", *Hamilton Canyon*, *Knopf* 37, 125. CATALINA DOGWOOD.

Order 19. **ERICALES.**

Flowers complete, regular. Calyx toothed, lobed, or divided, inferior, except in *Vacciniaceæ*. Corolla mainly gamopetalous. Stamens free from the corolla, or adnate only to its base (except in *Diapensia* and *Pyridanthera* of the *Diapensiaceæ*), as many as

its lobes and alternate with them, or twice as many. Ovary compound.

Family 1. **ERICACEÆ.**

HEATH FAMILY

Shrubs, perennial herbs, or trees, with simple estipulate leaves, and mostly perfect flowers. Calyx free from the ovary, 4-5-parted or 4-5-cleft, mostly persistent. Corolla regular, or rarely somewhat 2-lipped, usually 4-5-toothed, -lobed or -parted. Stamens hypogynous, usually as many or twice as many as the corolla-lobes, teeth or petals; anthers 2-celled, attached to the filaments by the back or base, the sacs often prolonged upwardly into tubes. Ovary 2-5-celled; stigma peltate or capitate; ovules usually numerous, anatropous. Fruit a capsule, berry or drupe. Seeds usually numerous and minute, or sometimes only 1 in each cavity; endosperm fleshy; embryo central; cotyledons short; radicle terete.

Drupe papillose or warty, fleshy.

Drupe smooth, not fleshy:

Leaf blades revolute, filaments filiform.

Leaf blades flat, filaments much dilated.

1. **COMAROSTAPHYLIS.**

2. **XYLOCOCCLUS.**

3. **UVA-URSI.**

1. **COMAROSTAPHYLIS** Zucc.

Shrubs with erect, diffuse, or prostrate stems. Leaves alternate, persistent, usually numerous; blades narrow or sometimes broad, coriaceous, often revolute, entire or toothed, petioled. Flowers few or numerous, in terminal solitary or clustered raceme-like panicles. Calyx persistent; lobes 5, or rarely 4, much longer than the tube, spreading or reflexed at maturity. Corolla cylindric-urceolate, ovoid-urceolate, or globular-urceolate; lobes 5, or rarely 4, broad and short, mostly recurved. Stamens 10, or rarely 8, included; filaments short, dilated near the base, unappendaged, pubescent; anthers broad, each sac with a slender awn. Ovary 5-celled, or rarely 4-celled, seated in a disk, depressed or ovoid, glabrous or pubescent; style columnar, often somewhat elongate; stigma minute, sometimes slightly dilated. Drupe globular, fleshy, the pericarp papillose or warty, the 5 (or fewer by abortion) nutlets, united into a round stone.

Leaf blades entire, obscurely pale-pubescent below.

Leaf blades toothed, cinerous-tomentulose below.

1. **polifolia.**

2. **diversifolia.**

1. **C. polifolia** (HBK) Zucc. Klotzsch, *Linnaea* 24:77 (1851).
Arctostaphylos polifolia HBK Nov. Gen. & Sp. 3:277 (1819).

A shrub with glabrous, or sparingly pubescent or puberulent twigs; leaf-blades linear, varying to slightly broadest above or below the middle, thick, 2-4.5 cm. long, acute or slightly spinescent at the apex, glabrous, at least ultimately so, and often shining above, pale and glabrous beneath, or with persistent scattered hairs, or puberulent, entire, revolute, short-petioled; panicles rather loosely flowered, the rachis and pedicels glabrous or with scattered hairs; calyx 5-5.5 mm. wide, the lobes ovate, usually broadly so, acute or acutish, glabrous or merely ciliate; corolla 8-9 mm. long; stamens about 3 mm. long, the filaments villous; ovary pubescent; drupes 5-6 mm. in diameter.

The only record that we have of this is: Swain's Canyon, *Jepson* 3064.

2. **C. diversifolia** (Parry) Greene, Bull. Calif. Acad. 2:406 (1887).
Arctostaphylos diversifolia Parry, A. Gr. Syn. Fl. N. A. ed. 2
1: 397 (1886).

A shrub with canescent-tomentulose twigs; leaf-blades elliptic or oval, varying to slightly broadest above or below the middle, 2-9 cm. long, obtuse or acutish, obscurely serrate-dentate, more or less revolute, finely reticulate, ultimately glabrous and somewhat shining above, cinereous-tomentulose beneath, short-petioled; panicles loosely flowered, the rachis and pedicels cinereous-tomentulose; calyx 6.5-8 mm. wide, the lobes lanceolate, acuminate, cinereous-tomentulose; corolla 5-7 mm. long; stamens 2.5-3.5 mm. long, the filaments villous below the middle; ovary pubescent; drupes globular, about 4 mm. in diameter.

Canyon sides near the bottoms. April to May. "Three trees from 4-5 m. high, in but one canyon"—*Trask*; *Brandege* (in herb. Gray). MANZANITA.

2. **XYLOCOCCUS** Nutt.

Shrubs with erect densely branched stems. Leaves alternate, persistent; blades broad, entire, revolute, short-petioled. Flowers few in terminal unbranched panicles with stout rachis and pedicels, the bracts scale-like. Calyx persistent; lobes 5, or rarely 4, very broad, much longer than the tube, reflexed at maturity. Corolla oblong-urceolate; lobes 5, or rarely 4, very small, spreading or recurved. Stamens 10, or rarely 8, included; filaments elongate, dilated near the base, unappendaged, pubescent; anthers broad, oval or ovoid, each sac with a slender awn. Ovary ovoid, 5-celled or rarely 4-celled, seated in a disk, pubescent; style elongate; stigma minute. Drupe dry, with a smooth pericarp and a thin pulp, the woody nutlets united into a solid stone.

1. **X. bicolor** Nutt. Trans. Am. Phil. Soc. 2, 8:259 (1843).
Arctostaphylos bicolor A. Gr. Proc. Am. Acad. 7:366 (1868).

A shrub densely branched above, with cinereous-tomentulose twigs; leaf-blades ovate or oval, often apparently narrowly so on account of the revolute margins, obtuse or acutish, 2-6 cm. long, entire, ultimately veiny and glabrous or nearly so above, more or less tomentose beneath, narrowed or rounded at the base, short-petioled; panicles short, recurved, densely few-flowered, the rachis and pedicels tomentulose; calyx about 5 mm. wide, the lobes reniform or ovate-reniform, obtuse, tomentulose; corolla 8-9 mm. long, white or pink, sometimes rose-colored, the lobes minute; stamens 5-6 mm. long, the filaments very slender above the dilated base, villous, the anthers nearly 2 mm. long; drupes globular, 6-8 mm. in diameter, often purplish-red.

Dry, exposed situations. April. It occurs "frequently beyond the Isthmus where it grows from 2.4-4 m. high"—*Trask*; *Lyon*, "Sometimes reaching a height of 4 m."; *Brandegee*. "Thin soil of a rocky, exposed point, forming a dense patch some 3 m. in diameter. Bushes about 12.2 dm. high," *Grant* 6158.

3. **UVA—URSI** Mill.

Low spreading or erect shrubs or small trees, with exfoliating bark, on trunks and old branches often polished and reddish-brown. Leaves alternate, petioled or sessile, firm or coriaceous, evergreen, often similar on both surfaces and vertical by a twist of the petiole. Flowers in terminal racemes or panicles, small, nodding on slender pedicels bracteolate at base, and borne in the axils of persistent or deciduous bracts. Calyx 5-parted, the oblong to orbicular lobes persistent. Corolla urceolate to oblong-campanulate, 5-lobed, the lobes short, rounded, recurved, imbricate in the bud. Stamens 10, included; filaments dilated and usually hairy at base; anthers erect, short, introrse, with 2 recurved dorsal awns; pollen-sacs opening by a terminal pore. Disk 10-lobed. Ovary 4-10-celled; ovules solitary in the cavity; style slender. Drupe with 4-10 seed-like nutlets, irregularly separable or united into a solid stone; pericarp thin or often with a granular pulp.

Terminal parts cinereous with a fine tomentum.	1. <i>pungens</i> .
Terminal parts setose-hispid to glandular-villous.	2. <i>tomentosa</i> .

1. **U-U. pungens** (HBK) Abrams, Bull. N. Y. Bot. Gard. 6:432 (1910).
Arctostaphylos pungens HBK. Nov. Gen. et. Sp. 3:278. (1819).

An erect shrub, branching from the base, 1-3 m. high, with smooth reddish-brown bark and branchlets more or less cinereous

with a fine tomentum; leaf-blades ovate to lanceolate or obovate to oblanceolate, 15-30 mm. long, usually less than 15 mm. wide, minutely grayish-tomentose when young, becoming dull-green or more or less shining; flowers in short spike-like racemes, the racemes simple or with 1 or 2 short branches; bracts triangular, 3 mm. long, tomentose throughout; pedicels 5-7 mm. long, glabrous; calyx-lobes rounded, 1.5 mm. long, glabrous; corolla 7 mm. long; ovary glabrous; fruit depressed-globose, 5-8 mm. broad, smooth, chestnut-brown; nutlets separable or irregularly coalescent, carinate and prominently corrugately wrinkled.

Dry canyon slopes. April to May. Reported by *Brandege* who includes under this species *A. insularis* Greene, which we judge to be a race of the next species. We have not been able to find a Catalina specimen of this species in any herbarium, nor have our collectors found it on the island.

2. *U-U. tomentosa* (Pursh.) Abrams, Bull. N. Y. Bot. Gard. 6:433 (1910).

Arbutus tomentosa Pursh. Fl. Am. Sept. 1:282 (1814).

Arctostaphylos tomentosa Lindl. Bot. Reg. 21, pl. 1791 (1836).

Arctostaphylos glandulosa Eastw. Proc. Calif. Acad. 3, 1:82 (1897).

An erect branching shrub, forming a low compact rounded bush a meter or more high, or sometimes arborescent and 3-4 m. high; bark smooth, bright or dark reddish-brown; young branchlets more or less tomentose and often setose-hispid or glandular-villous; leaf-blades petioled, broadly ovate to oblong-lanceolate, mostly more than 25 mm. long, varying from rather dark-green and nearly glabrous to densely canescent or glandular-pubescent at least toward the base; flowers in open or crowded panicles; bracts usually more or less foliaceous, often longer than the pedicels, persistent; pedicels variously pubescent or sometimes glabrate; calyx-lobes ovate to orbicular, nearly or quite glabrous, more or less ciliate on the margins; corolla white to rose-colored, 6-7 mm. long; filaments densely bearded at the base to nearly glabrous; ovary densely tomentose and more or less glandular to almost naked; fruit depressed-globose, 6-8 mm. broad, light yellowish-brown to deep chestnut-brown, glabrous, more or less tomentose or glandular; nutlets irregularly coalescent, acutely carinate.

Canyon slopes and ridges. December to May. *Lyon*; *Trask* (*A. glandulosa* of Eastwood); *Brandege* list; central ridge of Banning's Canyon, *Nuttall* 334; ridge between Black Jack and Echo Lake, trees up to 3 m. high, *Knopf* 272. MANZANITA.

Order 20. PRIMULALES.

Herbs, shrubs or trees. Corolla usually present, gamopetalous. Calyx mostly free from the ovary. Stamens borne on the corolla, as many as its lobes, or twice as many, or more.

Family I. PRIMULACEÆ.

PRIMROSE FAMILY

Herbs, with perfect regular flowers. Calyx free from the ovary (adnate to its lower part in *Samolus*), usually 5-parted, persistent or rarely deciduous. Corolla gamopetalous in our species, usually 5-cleft, deciduous. Stamens as many as the corolla-lobes and opposite them, hypogynous or rarely perigynous, inserted on the corolla; filaments distinct or connate at the base; anthers introrse, 2-celled, the sacs longitudinally dehiscent. Disk obsolete, or none. Ovary superior (partly inferior in *Samolus*), 1-celled; placenta central, free; ovules anatropous, or amphitropous; style 1; stigma simple, mostly capitate, entire. Capsule 1-celled, 2-6-valved, rarely circumscissile or indehiscent. Seeds few or several, the testa adherent to the fleshy or horny copious endosperm; embryo small, straight; cotyledons obtuse.

Flowers axillary, stems leafy.
Flowers scapose, leaves basal.

1. ANAGALLIS.
2. DODECATHEON.

1. ANAGALLIS Linn.

Herbs, with opposite or verticillate (rarely alternate) sessile or short-petioled leaves, entire or nearly so, and small axillary peduncled flowers. Calyx 5-parted, the lobes lanceolate or subulate, persistent. Corolla deeply 5-parted, rotate, the segments entire or erose, convolute in the bud, longer than the calyx. Stamens 5; filaments puberulent, or pubescent, distinct, or united into a narrow ring at the base; anthers oblong, obtuse. Ovary globose; ovules numerous; stigma obtuse. Capsule globose, circumscissile, many seeded. Seeds minute, flat on the back.

1. *A. arvensis* Linn. Sp. Pl. 148 (1753).

Annual, diffuse; branches 1-3 dm. long, 4-sided. Leaves ovate or oval, membranous, sessile or somewhat clasping, 6-20 mm. long, black-dotted beneath; peduncles filiform, 1-4 cm. long, recurved in fruit; calyx-lobes keeled, slightly shorter than the crenate glandular-ciliate corolla-segments; flowers scarlet, sometimes white, usually with a darker center, 4-6 mm. broad, opening only in bright weather; capsule glabrous, about 4 mm. in diameter.

Moist, rich soil of gulches. January to June. The flowers always rich salmon-pink. *Brandege*; ditches of Coach Road, *Smith* 5078; Schoolhouse Ridge, *Nuttall* 5; in shade, moist heavy soil of Avalon Run, *Mills* 4510, 4650; Pebble Beach Canyon, *Knopf* 110. PIMPERNEL, POOR MAN'S WEATHER GLASS.

2. DODECATHEON Linn.

Glabrous scapose perennial herbs, with basal leaves. Flowers in involucrate umbels terminating scapes. Calyx deeply 5-lobed, persistent, the lobes at first reflexed. Corolla 5-parted, the lobes reflexed, imbricated, the tube very short, thickened at the throat. Stamens 5, on the throat of the corolla; filaments short, flat, monadelphous, connivent into a cone, exserted; anthers linear or lanceolate, connivent, attached by their bases to the filaments. Ovary superior; ovules amphitropous; style exserted; stigma simple. Capsule oblong or cylindric, erect, 5-6-valved at the apex or splitting to the base. Seeds numerous, minute; the testa punctate.

Leaves erose, papillate margined.
Leaves entire, hyaline margined.

1. *Clevelandi*.
2. *Hendersoni*.

1. *D. Clevelandi* Greene, Pitton. 1:213 (1888).

Pale green and glandular, 3-6 dm. high; roots formed at the beginning of the dry season and remaining dormant, no tubers formed; leaves scarcely fleshy, ascending or erect, spatulate-obovate, the margins erose; corolla bright purple with a yellow base; filaments purple, becoming yellow at the base of the anthers; anthers purple except the midvein, about twice the length of the staminal tube, the apex blunt, retuse; capsule oblong, circumscissile at the top.

Moister canyon slopes and even dry ridges, abundant. February to May. Hamilton Canyon, *Moxley* 750; eastern slope of Avalon Canyon, *Mills* 4557; Reservoir Hill, *Nuttall* 1028; upper road to Pebble Beach, *Knopf* 101. SHOOTING STAR.

2. *D. Hendersoni* Gray, Bot. Gaz. 11:233 (1886).

Leaves broad and short with a hyaline margin, entire. Capsule chartaceous, at last nearly twice the length of the calyx, cylindraceous-oblong, becoming urceolate as the placenta enlarges and the open summit broadens: the short, more or less hemispherical apex becomes more distinctly circumscribed than in other species, and at length falls away (with the style) as a lid, and the truncate orifice seems indisposed to split up at all into valves.

Moister canyon slopes and ridges. April to May. *Mr. Brandege* reports this species under *D. Meadia* and includes *D. Jeffreyi*. We have been unable to turn up a specimen from Catalina in any herbarium and have not seen it on the island.

Order 21. GENTIANALES.

Herbs, shrubs, vines or trees. Leaves opposite, or rarely alternate. Flowers regular. Corolla gamopetalous, rarely polypetalous, nerved, wanting in *Forestiera* of the Oleaceae. Stamens mostly borne on the lower part of the corolla when this is present, as many as its

lobes or fewer and alternate with them. Ovaries 2, distinct, or 1 with 2 cavities (rarely more), or 2 placentae.

Stigmas distinct, juice not milky.

Stigmas united, juice milky:

Styles united, stamens distinct.

Styles distinct, stamens united.

1. GENTIANACEAE.

2. APOCYNACEAE.

3. ASCLEPIADACEAE.

Family I. GENTIANACEÆ.

GENTIAN FAMILY

Bitter mostly glabrous herbs, with opposite (rarely verticillate) estipulate entire leaves, reduced to scales in *Leiphaimos*, and regular perfect flowers in clusters, or solitary at the ends of the stems or branches. Calyx inferior, persistent, 4-12-lobed, toothed or -divided (of 2 sepals in *Obolaria*), the lobes imbricated or not meeting in the bud. Corolla gamopetalous, often marcescent, 4-12-lobed or -parted. Stamens as many as the lobes of the corolla, alternate with them, inserted on the tube or throat; anthers 2-celled, longitudinally dehiscent. Disk none, or inconspicuous. Ovary superior in our genera, 1-celled or partly 2-celled; ovules numerous, anatropous or amphitropous; stigma entire, or 2-lobed, or 2-cleft. Capsule mostly dehiscent by 2 valves. Endosperm fleshy, copious; embryo small, terete or conic.

1. CENTAURIUM Hill.

Herbs mostly annual or biennial, with sessile or amplexicaul leaves, and pink, white or yellow flowers in cymes or spikes. Calyx tubular, 5-4-lobed or -divided, the lobes or segments narrow, keeled. Corolla salverform, 5-4-lobed, the lobes spreading, contorted, convolute in the bud. Stamens 5 or 4, inserted on the corolla tube; filaments short-filiform: anthers becoming spirally twisted. Ovary 1-celled, the placentae sometimes intruded; style filiform; stigma 2-lobed. Capsule 2-valved. Seed-coat reticulated.

1. *C. venustum* (Gray) Rob. Proc. Am. Acad. 45:397 (1910).
Erythraea venusta Gray, Bot. Calif. 1:479 (1876).

Herb 2-3 dm. high, simple and cymosely several-flowered at summit, or corymbosely branched: leaves from ovate to oblong-lanceolate, rather obtuse (12.7-20 mm. long): calyx-lobes very narrow down to the base: corolla deep and bright pink with a yellow centre; the lobes oval and obtuse, becoming oblong, 8.4-12.7 mm. in length: filaments rather longer than the oblong-linear anthers.

In grass in canyons and rigdes. May to June. *Lyon; Brändegee; Trask;* Coach Road near Summit, *Smith 5077*; Rock Spring Canyon, *Smith 5099*; Pebble Beach and Grand Canyons, *Nuttall 185, 609*. CANCHALAGUA.

A decoction of the root is used, by the Mexicans, as a tonic.

[*Erythraea trichantha* Griseb. Dr. Gray says (Bot. Calif. 2:464):

"Santa Catalina, *Dr. Schumacher*." Parish remarks (Zoe 5:116) "Subsequent collectors there have not found it. There is no specimen from Schumacher, or any Santa Catalina specimen, in the Gray Herbarium and the authenticated range of the plant does not indicate its presence on the island." Our collectors have not seen it, nor can we find a Catalina specimen in any herbarium].

Family 2. APOCYNACEÆ.

DOGBANE FAMILY

Perennial herbs, shrubs, vines, or some tropical genera trees, mostly with an acrid milky juice, with simple estipulate leaves, and perfect regular 5-parted flowers. Calyx inferior, persistent, the lobes imbricated in the bud. Corolla gamopetalous, its lobes convolute in the bud and often twisted. Stamens as many as the lobes of the corolla, alternate with them, inserted on the tube or throat; anthers 2-celled; pollen-grains simple. Ovary superior, or its base adherent to the calyx, of 2 distinct carpels, or 1-celled, with 2 parietal placentæ, or 2-celled; ovules anatropous or amphitropous. Style simple, or 2-divided; stigma simple. Fruit usually of 2 follicles or drupes. Seeds often appendaged; endosperm fleshy; embryo straight; radicle terete, usually shorter than the cotyledons.

1. VINCA Linn.

Herbs, some species slightly woody, with opposite leaves and large solitary axillary flowers. Calyx 5-parted, the segments acuminate. Corolla salverform, the tube pubescent within, the lobes oblique. Stamens included. Disk of 2 glands, alternate with the 2 carpels. Ovules several in each carpel; style filiform; stigma annular, its apex penicillate. Follicles 2, cylindric, several-seeded. Seeds oblong-cylindric, truncate at each end.

1. *V. minor* Linn. Sp. Pl. 209 (1753).

Perennial, trailing, glabrous; stems 1.5-6 dm. long. Leaves oblong to ovate, entire, firm, shining, green both sides, narrowed at the base, short-petioled, 2-6 cm. long; flowers blue, 1.8-3 cm. broad; peduncles 1-4 cm. long; calyx-segments subulate-lanceolate, glabrous; corolla-

tube expanded above, as long as or slightly longer than the obovate, nearly truncate lobes; anther-sacs with a broad connective.

Escaped from gardens to grassy situations near Avalon, *Millsp., Nuttall 301*; and at Cherry Valley and Howland's. PERIWINKLE, GROUND MYRTLE.

Family 3. ASCLEPIADACEÆ.

MILKWEED FAMILY

Perennial herbs, vines or shrubs, mostly with milky juice, with estipulate leaves, and cymose or umbellate, perfect regular flowers. Calyx inferior, its tube very short, or none, its segments imbricated or separate in the bud. Corolla campanulate, urceolate, rotate or funnelform, 5-lobed or 5-cleft, the segments commonly reflexed. A 5-lobed or 5-parted crown (corona) between the corolla and the stamens and adnate to one or the other. Stamens 5, inserted on the corolla; filaments short, stout, mostly monadelphous, or distinct; anthers attached by their bases to the filaments, introrsely 2-celled, connivent around the stigma, or more or less united with each other; anther-sacs tipped with an inflexed or erect scarious membrane, or unappendaged at the top, sometimes appendaged at the base; pollen coherent into waxy or granular masses, one or rarely two such masses in each sac, connected with the stigma in pairs or fours, by 5 glandular corpuscles alternate with the anthers. Disk none. Ovary of 2 carpels; styles 2, short, connected at the summit by the peltate discoid stigma; ovules numerous in each carpel, mostly anatropous, pendulous. Fruit of 2 follicles. Seeds compressed, usually appendaged by a long coma; endosperm cartilaginous; embryo nearly as long as the seed; cotyledons flat.

1. PHILIBERTIA HBK.

Perennial herbaceous or shrubby twining plants, with opposite petiolate leaves and dull-colored fragrant flowers; peduncles umbellately several-many-flowered. Calyx minutely 5-glandular within. Corolla open-campanulate or (in our species) rotate and deeply 5-cleft or -parted; lobes commonly ciliate, narrowly overlapping. Crown double, the outer a membranous ring adnate to the base of the corolla, the inner of 5 fleshy or hood-like scales adnate to the base of the staminal column. Stigma flat or umbonate or with a short 2-cleft beak. Follicles rather thick, smooth, acuminate.

1. *P. hirtella* (Gray) Parish, Muhl. 3:126 (1907).

Sarcostemma heterophyllum hirtellum Gray, Bot. Calif. 1:478 (1876).

Philibertia linearis hirtella Gray, Syn. Fl. 2:88 (1878).

Slender, low twining or when young erect; cinereous-pubescent throughout with short spreading hairs. Leaves narrowly linear, acute or nearly so at both ends, short-petioled (2.6 cm. long); peduncle exceeding the leaves, 8-10-flowered; corolla yellowish, purplish or whitish. 8.4 mm. long; sepals slender; calyx-lobes ovate; crowns contiguous.

Festooning rocks. May. *Mrs. Trask* says: "In one locality it covers a great rock which, falling from an overhanging cliff, has nearly filled the narrow arroyo." This is the only knowledge we have of this plant on Catalina.

Order 22. POLEMONIALES.

Mostly herbs; rarely shrubs or trees. Corolla almost always gamopetalous, regular or irregular. Stamens adnate to the corolla-tube usually to the middle or beyond, as many as the corolla-lobes, or fewer and alternate with them. Ovary 1, superior, compound (in Boraginaceae and Lamiaceae deeply 4-lobed around the style).

Stamens 5:

Gynoecium of 2 distinct carpels

1. DICHONDRAEAE

Gynoecium of partially or wholly united carpels:

Fruit capsular or baccate, ovary not 4-lobed:

Styles of stigmas distinct:

Ovary 2-celled:

Leaves normal, plants not parasitic

2. CONVULVULACEAE

Leaves none, plants parasitic

3. CUSCUTACEAE

Ovary 1-celled

4. HYDROPHYLLACEAE

Ovary 3-celled

5. POLEMONIACEAE.

Styles or stigmas wholly united:

Flowers regular

6. SOLANACEAE

Flowers irregular

7. SCROPHULARIACEAE

Fruit of 2-4 nutlets

8. BORRAGINACEAE

Stamens 4 didynamous, or 1 or 2:

Carpels ripening into a group of 4 nutlets:

Styles apical on the lobeless ovary

9. VERBENACEAE

Styles arising between the 4 lobes of the ovary

10. LAMIACEAE

Carpels ripening into a capsule, plants parasitic

11. OROBANCHACEAE

Family 1. DICHONDRAEÆ.

DICHONDRA FAMILY

Prostrate or creeping slender herbs, with nearly orbicular, cordate or reniform, petioled entire leaves, and small solitary axillary peduncled flowers. Sepals nearly equal. Corolla open-campanulate, deeply 5-lobed. Stamens shorter than the corolla; filaments filiform. Ovary

villous, deeply 2-parted, each lobe 2-celled; styles 2, simple, arising from the bases of the ovary-lobes; stigmas capitate. Fruit of two pubescent, 2-valved or indehiscent, 1-2-seeded capsules.

Ovary 2-parted
Ovary entire

1. DICHONDRA
2. CRESSA

1. DICHONDRA Forst.

Characters of the family.

1. *D. occidentalis* House, Muhlenb. 1:130 (1906).

Stem perennial, slender, creeping, branching, 10-40 cm. long, glabrate or appressed pubescent with silvery hairs when young: leaf-blades large, broadly reniform, 2-5 cm. broad, 1-3 cm. long, usually retuse at the apex, glabrous or with some scattered pubescence, dark green above, paler beneath, shallowly cordate and somewhat cuneate at the base, 7-nerved; petioles 5-8 cm. long, pubescent toward the base: peduncles filiform, 1-2 cm. long: calyx turbinate, densely pubescent, its lobes obovate, 1.5 mm. long, blunt or rounded, scarcely enlarged in fruit: corolla nearly twice as long as the calyx, subrotate, white, its lobes ovate, obtuse: capsules about 4 mm. high, subglobose, sericeous-pubescent: seeds brown, glabrous, 1.5 mm. long.

Rather moist shady situations. March to April. *Mrs. Trask*, who was the only collector of this species, says: "Flowers never seen. Found in three localities only"; Avalon, April, 1898, (as *Dichondra repens*).

2. CRESSA Linn.

Corolla deeply 5-cleft, not plaited; the oblong or ovate lobes more than half the length of the somewhat campanulate tube, lightly convolute in the bud, or with one lobe external. Stamens and the two distinct entire styles exserted. Stigmas capitate. Capsule 2-valved, by abortion commonly one-seeded.

1. *C. truxillensis* HBK. Nov. Gen. et Sp. 3:93 (1818).

Perennial herb, 22-44 cm. high, erect or diffuse, exceedingly branched, silky-villous and hoary: leaves very numerous, small (4.2-8.4 mm. long), almost sessile, mostly ovate-lanceolate or oblong: flowers sessile or short-peduncled in the upper axils: corolla 4.2-6.3 mm. long, white, silky-pubescent outside, a little longer than the calyx.

Saline situations in open places, but extending well inland. April to June. Ballast Point in Catalina Harbor, *Lyon*; *Trask*; *Brandegee* (as *C. cretica*): *Macbride & Payson* 871; *Millsp.* 4789; *Nuttall* 804. Avalon vicinity, *Mrs. Miller*; *Eastwood* 6390; *Nuttall* 828. Middle Ranch, *Nuttall* 664, much taller and less pubescent than the plants of saline influence. Howland's, *Nuttall* 809.

Family 2. **CONVOLVULACEÆ.**

MORNING GLORY FAMILY

Herbs or vines, some tropical species shrubs or trees, with alternate estipulate leaves, and regular perfect axillary cymose or solitary flowers. Calyx inferior, 5-parted or 5-divided, usually persistent, the segments or sepals imbricated. Corolla gamopetalous, the limb 5-angled, 5-lobed or entire. Stamens 5, inserted low down on the tube of the corolla and alternate with its lobes, all anther-bearing, the filaments filiform, or dilated at the base; anthers 2-celled, the sacs longitudinally dehiscent. Disk annular or none. Ovary superior, sessile, 2-3-celled, with 2 ovules in each cavity, or falsely 4-6-celled with a single ovule in each cavity, usually entire; styles 1-3, terminal, ovules anatropous. Fruit mostly a 2-4-valved capsule. Seeds erect, the testa villous, pubescent or glabrous; embryo plaited or crumpled; cotyledons foliaceous; endosperm fleshy or cartilaginous, usually scanty.

Stigmas capitate.
Stigmas filiform or oblong.

1. **IPOMŒA.**
2. **CONVOLVULUS.**

1. **IPOMŒA** Linn.

Twining trailing or rarely erect herbs, with large showy axillary flowers. Corolla funnelform or campanulate, the limb entire, 5-angled or 5-lobed, the tube plaited. Stamens included. Ovary entire, 2-4-celled, 4-6-ovuled; styles united, included; stigmas 1 or 2, capitate or globose. Capsule usually septifragally 2-4 valved, 2-4-seeded.

1. **I. hederacea** Jacq. Icon. Rar. pl. 36 (1781).

Annual, pubescent; stem twining or climbing to a height of 6.8-15 dm., slender, retrorsely hairy. Leaves ovate-orbicular in outline, long-petioled, deeply 3-lobed, cordate at the base, 5.1-12 cm. long, the lobes ovate, acuminate, entire, or the lateral ones sometimes repand or dentate; peduncles 1-3-flowered, much shorter than the petioles; flowers opening in early morning, soon closing; sepals lanceolate with long linear often recurved tips, densely hirsute below, sparingly so above, 2-3 dm. long; corolla funnelform, the tube usually nearly white, the limb light blue or purple, 2.6-3.8 cm. long; ovary 3-celled; stigmas 3; capsule depressed-globose, 3-valved, about as long as the lanceolate portion of the sepals.

Plentifully escaped from gardens and fully established in canyons. January to December. Vicinity of Avalon, *Mills* sp. 4541, and in Cherry Valley, at Howland's and Johnson's Landings. MORNING-GLORY.

2. CONVOLVULUS Linn.

Herbs (the following species perennials with slender roots or rootstocks) with trailing, twining or erect stems. Leaves entire dentate or lobed, mostly cordate or sagittate and petioled. Flowers axillary, solitary or clustered, large, pink, purple or white. Sepals nearly equal or the outer larger, the calyx bractless or with a pair of bracts at its base. Corolla funnellform or campanulate, the limb plaited, 5-angled, 5-lobed or entire. Stamens inserted on the tube of the corolla, included; filaments filiform, or dilated at the base. Ovary 1-2-celled, 4-ovuled; style filiform; stigmas 2, filiform, oblong, or ovoid. Capsule globose or nearly so, 1-4-celled, 2-4-valved. Seeds glabrous.

Leaves fleshy, maritime species.

1. *Soldanella*.

Leaves not fleshy, interior species:

Peduncles shorter than the petioles.

2. *californicus*.

Peduncles much exceeding the petioles:

Leaves sagittate.

3. *occidentalis*.

Leaves hastate.

4. *sepium*.

1. **C. Soldanella** Linn. Sp. Pl. 159 (1753).

Maritime, low, glabrous: stems 3.3 dm. or less in length, trailing, rarely attempting to climb: leaves kidney-shaped, entire or obscurely angulate-lobed, 2.6-5.1 cm. broad, long-petioled: bracts ovate-cordate, not longer than the sepals: corolla pink or purplish, 2.6 cm. or more in length: capsule becoming one-celled.

In the sand of the sea beaches. May to June. *Lyon; Brandege*. SEASIDE MORNING-GLORY.

2. **C. californicus** Choisy. DC. Prodr. 9:405 (1845).

Minutely and rather densely pubescent, or somewhat glabrate, 2.2 cm. or less high and subcaulescent, or producing trailing stems 2-3 dm. long: leaves mostly obtuse, from ovate or obovate and obscurely hastate to triangular-hastate and the later ones acute, and the basal lobes sometimes 1-2-toothed, long-petioled: peduncles shorter than the petiole: bracts oblong or oval, not unlike the outer sepals and equalling them, or rather shorter: corolla white, cream-color, or flesh-color. 3.8-5.1 cm. long.

Climbing over shrubbery. April to May. *Lyon; Brandege*. CALIFORNIA BINDWEED. We have failed to find this, or the previous species on the island, but do not doubt their occurrence there.

3. **C. occidentalis** Gray, Proc. Am. Acad. 11:89 (1875).

Glabrous or minutely pubescent: stems twining, 6-15 dm. high: leaves from broadly ovate-triangular with a deep and narrow basal sinus to narrowly lanceolate-hastate; the posterior lobes often 1-2-toothed: peduncle elongated, not rarely 2-flowered within the bracts:

these ovate or rarely oblong, commonly surpassing and enclosing the calyx: corolla white or pinkish, 2.6-3.8 cm. long, and the expanded limb as wide.

Dry canyon slopes everywhere. January to June. The prevalent species on the island. *Lyon*; *Trask*; *Brandege*; *Millsp.* 4496, 4657, 4752; *Nuttall* 2, 1043; *Smith* 5079; *Knopf* 54. All our collectors have failed to find a specimen of this species that would answer to *C. macrostegius* of Guadalupe Island. WESTERN BINDWEED.

4. *C. sepium* Linn. Sp. Pl. 153 (1753).

Glabrous or sparingly pubescent; stems extensively trailing or high-twining, 9-30 dm. long. Leaves slender-petioled, triangular in outline, hastate, 5.1-12 cm. long, acute or acuminate at the apex, the basal lobes divergent, usually acute, angulate-dentate or entire; petioles 12-50 mm. long; peduncles 1-flowered, longer than the petioles, often 2-3 times as long; flowers pink with white stripes or white throughout, about 5-1 cm. long; bracts at the base of the corolla, large, ovate, acute or obtuse, cordate; stigmas oblong.

Dry situations. February to April. Climbing over *Eriogonum giganteum* in the arroya of Avalon Valley, *Millsp.* 4657. GREAT BINDWEED. This is the only return of the species from Catalina and is the most southerly record for this plant on the Pacific Coast.

[*Quamoclit* sp. An exotic species of *Quamoclit*, at present unplaced, grows in a large clump in the grounds of the Banning House, at the Isthmus. It is here recorded in the event of its possible establishment later.

Slender vine growing in a congested clump. Stems 10 dm. or more in length, smooth. Leaves alternate triangular-hastate, petioled, dull green above, pale beneath, 1.5 x 1 cm. more or less. Inflorescence axillary, single flowers on peduncles longer than leaves. Calyx 5-parted, 3 and 2 divisions ovate, acuminate, 1 cm. or more long, hairy; corolla about 3 x 1.5 cm. gibbous and inflated, white at base shading to dark blue-purple above, irregular, lobes 3 and 2. Stamens 4, in 2 pairs attached near the base of the corolla, filaments hairy at base, anthers versatile. Style single; stigma linear; ovary single 1-celled, many seeded. *Nuttall* 907].

Family 3. CUSCUTACEÆ.

DODDER FAMILY

White, red or yellow slender parasites, dextrorsely twining, the leaves reduced to minute alternate scales. Calyx inferior, 5-lobed or 5-parted (rarely 4-lobed or 4-parted), or of 5 distinct sepals. Corolla 5-lobed (rarely 4-lobed), the tube bearing as many fimbriate or crenulate scales as there are lobes and alternate with them, or these sometimes obsolete. Stamens as many as the corolla-lobes, inserted in the throat or sinuses above the scales; anthers short.

ovate or oval, obtuse, 2-celled, the sacs longitudinally dehiscent. Ovary 2-celled; ovules 2 in each cavity; styles 2, terminal, separate, or rarely united below stigmas linear or capitate. Capsule globose or ovoid, circumscissile, irregularly bursting or indehiscent, 1-4-seeded. Seeds glabrous; embryo linear, terete, curved or spiral, its apex bearing 1-4 minute alternate scales; endosperm fleshy; cotyledons none.

I. CUSCUTA Linn.

Characters of the family. The filiform twining stems are parasitic on herbs and shrubs by numerous minute suckers. The seeds germinate in the soil and the plantlet attaches itself to its host, its root and lower portion soon perishing. The subsequent nutrition of the parasite is apparently wholly through its suckers. Indications of a small amount of green coloring matter, possibly chlorophyll, have been observed in some species.

1. *C. occidentalis* Millsp. *nom. nov.*

Cuscuta californica breviflora Engelm. Tr. Acad. Sci. St. Louis 1:499 (1859).

Flowers subsessile in dense glomerules; corolla somewhat narrowly campanulate; stamens and styles short; anthers oval. The flowers as the capsule matures, when viewed from above, present a rather characteristic stellate appearance because of the spreading of the lobes.

In our opinion this plant presents sufficient characters to distinguish it as a species. The designation *breviflora* not being tenable, we are obliged to go further for a distinctive appellation.

On low shrubs in dry situations beyond the coast. March to September. *Trask*; *Brandege*; on the Golf Links and at the base of Black Jack, *Nuttall* 272, 902. WESTERN DODDER.

Family 4. HYDROPHYLLACEÆ.

WATER-LEAF FAMILY

Herbs or rarely shrubs with watery insipid juice alternate or sometimes opposite leaves no stipules, mostly a scorpioid inflorescence in the manner of Borraginaceæ, regular 5-merous 5-androus flowers with the stamens borne on the base or lower part of the corolla alternate with its lobes, a 2-merous ovary with the two styles distinct or partly united the stigmas terminal. Ovules amphitropous or anatropous, from 4 to very many, pendulous or when numerous almost horizontal. Hypogynous annular disk at the base of the ovary often

conspicuous. Fruit a capsule, 1-celled with two parietal placentaë or incompletely 2-celled by the approximation or meeting of the placentaë (borne on semisepta), or even completely 2-celled by their union in the axis. Seeds with a close and unusually reticulated or pitted testa and a small or slender embryo in cartilaginous or firm-fleshy albumen. Scorpioid cymes sometimes complete more commonly reduced to geminate or solitary false spikes or racemes, the pedicels bractless. Calyx 5-parted or of nearly distinct sepals.

Placentae membranaceous lining the pericarp.

Calyx appendaged.

Calyx unappendaged.

Placentae axial, linear.

Corolla deciduous.

Corolla persistent.

Placentae on the half-dissepiments.

1. NEMOPHILA.

2. ELLISIA.

3. PHACELIA.

4. EMMENANTHE.

5. ERIODICTYON.

I. NEMOPHILA Nutt.

Diffuse, more or less hirsute tender winter-annuals with opposite or alternate and usually pinnatifid leaves; inflorescence in terminal and lateral racemes or single on terminal or lateral peduncles; flowers white, blue or violet (frequently all in one species); corolla longer than the calyx except in one species.

Inflorescence racemose.

Leaves amplexicaulous.

Leaves petiolate:

Capsule tetraspermous.

Capsule monospermous.

Inflorescence solitary.

1. aurita.

2. erodiifolia.

3. racemosa.

4. insignis.

*Leaves mostly alternate, stems long and weak beset with sparse and stiff reflexed prickles by which the plants are disposed to climb; later flowers unaccompanied by leaves therefore loosely racemose; ovules 4 only.

1. *N. aurita* Lindl. Bot. Reg. 19:t. 1601 (1833).

Stems 3-9 dm. long, leaves all with an auriculate-dilated and clasping base or winged petiole, the upper deeply pinnatifid into 5-9 oblong or lanceolate and mostly retrorse lobes; calyx appendages small; corolla violet, nearly 2.5 cm. in diameter, its internal appendages broad, partly free, in pairs at the base of each stamen; seeds globose, reticulated with the spaces deeply sunken.

Shady places in cañons. May. Rock Falls Cañon, Nuttall 252, Silver Canyon, 1209; Knopf 41; Brandegee and Mrs. Trask "on nearly all cañon sides" (N. Y.; U. S., 349923).

2. *N. erodiifolia* Millsp. *sp. nov.*

Herba, debilis, aquosa, decumbens, 3-6 dm.; rami multi, divaricati.

infra glabri, supra retrorsum uncinulo-setosa; folia inferiora opposita, superiora alterna, petiolata, utrinque setis compressis eis petiolorum non dissimilibus vestita (facie inferiore densius pubescenti atque aliis setis longis aciculatis apud compressos conspersis instructa): omnia triangulato-ovata, pinnatifida in 5-7 segmenta deltoidea aequalia irregulariter dentataque sinibus angustis. Inflorescentia racemus longus laxis apertusque; pedunculo foliis multo longiore; pedicellis gracilibus calyce circ. triplo longioribus; floribus candidis vel caeruleis, campanulatis, 1 x 1 cm.; calyce quam corolla fere dimidio brevior, auriculis late triangularibus, lobis inaequalibus circ. 7 mm. longis, lanceolatis, apice obtusis vel rotundatis; corollae tubo late cylindrico, lobis ovatis ad apicem sparsissime ciliatis tubumque subaequantibus; filamentis longitudine corollae tubum aequantibus et eius parti tertiae infimae adnatis, antheris purpureis. Capsula chartacea, globosa, calyce paulo longior, sparsim setosa, tetrasperma; seminibus immaturis triangulari-ovatis, dilute brunneis, distincte granulatis. *N. auritae* Lindl. affinis sed omnino valde diversa. Habitu *N. racemosae* Nutt. adpropinquans.

Shady or moist grassy places, Feby. to April. Beneath low oaks, flowers white, Pebble Beach Cañon, Feby. 7, 1920, *Millsp.* 4687 TYPE (in herb. Field Museum); shady roadside ditch, flowers light blue, Coach Road at the Wishbone, Feby. 5, 1920, 4683; grassy places beneath trees, flowers pale blue, Catholic Church Cañon, March 11, 1920, 4768; moist grassy slope, flowers dark blue, Hamilton Cañon, April 1, 1920, 4905. Not seen in other collections from the Island.

3. *N. racemosa* Nutt. Gray in Proc. Am. Acad. 10:315 (1875).

More slender and weak than the two preceding species, leaves shorter and with fewer divisions and having a naked petiole, the blade ovate rather than linear in general outline (nearly as in the last species); flowers only about half the size of the last, corolla little longer than the calyx. Setae about the same as in the preceding differing but little if any on the two surfaces of the blade.

Shady situations, March to May. Near Avalon, *Grant* 841; Coach Road near Summit, *Smith* 5023; Gallagher's Cañon, *Millsp.* 4874; Coach Road, *Nuttall* 49, 59, 1078; *Knopf* 13; *Dall & Baker*, *Brandegge*; *Mrs. Trask*; *McClatchie* (N. Y.);

** Leaves all or almost all opposite surpassed by the slender peduncle of the axillary or terminal single flower; ovules 8-24 maturing 5-15 seeds.

4. *N. insignis* Dougl. Benth. Trans. Linn. Soc. 18:275 (1834).

Nemophila Menziesii var. Hook. & Arn. Bot. Beechey 372 (1840).

Nemophila Menziesii insignis Brand Univ. Calif. Bot. 4:210 (1912).

Leaves pinnately parted into 7-9 oblong and sometimes 2-3-lobed small divisions; corolla bright blue sometimes pure white, up to 2.5 cm. in diameter, the internal scales short and roundish, partly free, hirsute with short hairs. Seeds oval, somewhat corrugated or tuberculate.

Damp roadside ditch. February to May. *Mrs. Trask* (U. S., Field) says: "Thrives in one locality", this must be along the South Hill Road above Avalon, where it is often pure white, *Millsp.* 4701, 4838; and *Nuttall* 102, 594; *Knopf* 387; Middle Ranch Canyon, *Knopf* 365. It has also been transplanted to borders in the St. Catherine grounds. BABY BLUE-EYES.

2. ELLISIA Linn.

Calyx 5-parted stellately enlarging and more foliaceous under the fruit, the sinuses destitute of appendages; corolla either broadly or narrowly campanulate, mostly short in proportion to the calyx, the internal appendages at base minute or obsolete; the lobes in the Californian species usually one outside and one inside of the bud. Stamens and style shorter than the corolla; filaments naked, anthers oval or cordate. Ovary, capsule, etc. nearly as in the preceding. Annuals, the leaves opposite or the uppermost alternate, once or twice pinnatifid; flowers small on solitary peduncles in the forks, or bractless and loosely racemose at the summit of the branches, corolla white or whitish.

* Leaves mainly twice or thrice pinnatifid; ovules 8, a pair on the back and front of the placenta; seeds oblong-oval, dissimilar, usually two remaining concealed after dehiscence—*Eucrypta* Nutt.

1. *E. chrysanthemifolia* Benth. Trans. Linn. Soc. 17:274 (1834).
Eucrypta chrysanthemifolia Greene Bull. Calif. Acad. 1, 4:200 (1885).

Erect, simple or branched, 1-3 dm. high, villous and more or less glandular-viscid above; internodes short; leaves opposite, the upper alternate, pilose, twice or thrice pinnatifid, the ultimate ones always simply pinnatifid, segments numerous, oblong, lobes ovate acute: racemes opposite the alternate leaves, elongated in fruit, pedicels longer than the calyx; flowers white or sometimes with pink stripes within near the base; calyx lobes oblong or broadly oval shorter than the open, campanulate corolla, about equalling the small capsule which is usually 6-seeded, the mostly 4 ordinary seeds rugose-tuberculate and enclosed between the placentæ, free in dehiscence, and between the placentæ and the valve 1 smooth and meniscoid.

Common everywhere in shade. February to July. *Smith* 4998, 5025, 5066; *Millsp.* 4682, 4689, 4757, 4904; *Nuttall* 50, 137, 495, 593; *Brandegee*; *Lyon*; *Mrs. Howland*, *Mrs. Trask* (U. S. 340052); *Knopf* 113.

3. PHACELIA Juss.

Annual or some few perennial herbs with alternate single or compound leaves and more or less scorpioid cymes or so-called racemes or spikes. Corolla deciduous or at least thrown off by the ripening capsule. Blue, purple or white; the tube with or sometimes without

internal appendages, these when present usually in the form of 10 vertical folds or lamellar projections on the lateral veins, in pairs, either adnate to or free from and alternate with the base of the slender filaments. Calyx lobes commonly narrow, often widening upward, more or less enlarging in fruit. Seed coat pitted or reticulated.

Corolla destitute of appendages:

Seeds 20-50.

Seeds 60-80.

1. *viscida*.

2. *grandiflora*.

Corolla with 10 appendages:

Ovules 2.

Sepals hispid.

Sepals pilose.

Ovules more than 2.

3. *hispida*.

4. *distans*.

5. *Lyoni*.

*Ovules 20-80, on both sides of the placentae. Appendages of the corolla none. Seeds small, testa favose-pitted—*Gymnobythus* A. DC.

1. ***P. viscida*** (Benth.) Torrey Mex. Bound. Surv. 2:143 (1859).

Eutoca viscida Benth. Bot. Reg. 21:t. 1808 (1835).

Annual 3-6 dm. high, branching, hirsute at the base very glandular above; leaves ovate or obscurely cordate, doubly or incisely and irregularly dentate, 2.5-5 cm. long; calyx lobes linear or becoming obscurely spatulate, about the length of the abruptly cuspidate-pointed capsule the firm placentae of which persist on the valves; corolla deep blue with a purple or whitish center (sometimes white), from 1-2 cm. in diameter.

On mountain heights, especially where fire has passed. March to May. *Brandegee* list (as *P. viscidula*): from *Trask* specimen (U. S.; photo. Field). She says: "One locality only." STICKY PHACELIA.

2. ***P. grandiflora*** (Benth.) Gray Proc. Am. Acad. 10:321 (1875).

Eutoca grandiflora Benth. Trans. Linn. Soc. 17:278 (1834).

Very like the preceding or disposed to be more hispid; corolla light blue or sometimes white, 2.5-4 cm. in diameter; capsule about 6 mm. the cuspidate persistent and indurated base of the style 2 mm. in length.

In cultivated and burned-over ground. *Brandegee*.

** Ovules 4, 2 to each side of the placenta; appendages of the corolla 10, laminate, in pairs at the base of the stamens; seeds often fewer than 4, testa aerolate-reticulate or favose—*Euphacelia* Gray.

*This name had previously been utilized by Buckley (Proc. Acad. Sci. Phila. 1861(2):463) for a *Phacelia* that Gray considers, in the same publication 1862:161, to be *Eutoca patuliflora*, Engelm. & Gray (Bost. Jour. Nat. Hist. 5:253 (1845) = *Phacelia patuliflora*, Gray Am. Acad. 10:321 (1875). I hesitate adding another and distinctive name: the American Code warrants such renaming though the International does not.

3. *P. hispida** Gray Syn. Flora N. A. II, 1:161 (1878).

Phacelia hispida genuina Brand Univ. Calif. Bot. 4:214 (1912).

A slender or robust stemmed ascending or erect annual; stems simple or branched, 15-65 cm. high, densely hispid; leaves very variable often pinnate or pinnatifid the segments often short-petiolate or sessile, often broadly ovate and irregularly incised or oblong and serrate, the lower long petioled the upper short petiolate or sessile, pinnatifid-incised. Circinnate racemes terminal, single or paired, densely flowered; pedicels distinct; sepals linear-lanceolate, acute, short pilose and densely hispid with long hairs, 6-9 mm. long; corolla white or blue, oblong-campanulate 8-12.5 mm. long, lobes short and broad, slightly hispid rarely glabrous, appendages semi-lanceolate; stamens sometimes shorter sometimes longer than the corolla; ovary globose, pilose and hispid; style parted above the middle. Capsule globose, hispid; seeds brown, foveolate.

Open situations in poor soil. March to July. On bald sea cliff near Pebble Beach, Pendleton 1364, 1411; Millsp. 4743; Nuttall 70; Descanso Cañon, Nuttall 178 and the Coach Road 189, 590. Brandegee; Lyon; Mrs. Howland; Mrs. Trask (N. Y.; U. S. 340193); Knopf 53, 111, 210; Pebble Beach Road, Smith 5053.

4. *P. distans* Benth. Bot. Voy. Sulph. 36 (1844).

Phacelia tanacetifolia of authors, non Benth.

Phacelia distans scabrella Brand Pflanzenr. 4:251 (1913), as to Mrs. Trask's Catalina specimen in herb. U. S. Natl. Mus.

Robust, branching from the base, somewhat hirsute, 10-60 cm. high. Leaves pinnatifid, bipinnatifid or nearly pinnate, divisions sessile, pinnatifid or crenate, lobes ovate entire or slightly dentate; racemes circinnate, terminal, solitary or in pairs, densely flowered; pedicels slight or wanting; sepals 4-5 mm. long, broadest at the middle, hirsute and with a fine, short, somewhat glandular tomentum beneath; corolla blue, campanulate, 5-10 mm. long; appendages free at the apex; stamens somewhat longer than the corolla; ovary globose, pilose; style parted below the middle, ciliate below, twice or more longer than the calyx. Capsule globose, pilose, about half as long as the calyx; seeds brown, reticulate and tuberculate, one facet carinate.

Ascending among bushes or grasses in deep shade. March to May. Trask U. S.; photo. Field), also as *P. ciliata*; Reed 2817 in part; Pebble Beach, Millsp. 4887, 4888. Brandegee.

*** Ovules on each side of the placentae more than 2, testa areolate-reticulate or favose-pitted but not transversely rugose; appendages of the mostly campanulate corolla in the form of 10, vertical, salient lamellae; capsule ovate or oblong.—*Eutoca* R. Br.

5. *P. Lyoni* Gray Proc. Am. Acad. 20:303 (1884).

Viscid pubescent and heavy-scented, 6 dm. or more high, robust; leaves pinnately divided into narrowly oblong and deeply pinnatifid divisions their short lobes oval and crenate; spikes dense; corolla pale

or ochroleucous, 4-8 mm. long, broadly campanulate, appendages semi-oval their base united to the filaments; stamens and style not exerted; capsule narrowly oblong, many-seeded, nearly equalling the linear-spatulate hispid and viscid sepals; seeds oval, scrobiculate.

In dry situations. May to July. An endemic species first collected by *Nevin & Lyon* in June, 1884 (Gray; photo. Field); *Trask*. On cliffs near Avalon, *Eastwood* 6453, *Hall* 8283; banks of Pebble Beach Road, *Pendleton* 1365; *Reed* 2817; Lookout Point, in fruit, *Nuttall* 838; *Knopf* 163, 211, *Nuttall* 69; Rattlesnake Cañon, *Nuttall* 263 and along the Coach Road 591; *Blake* 967; *Brandegee*.

4. EMMENANTHE Benth.

Low annuals with much the habit and general character of some sections of *Phacelia* but the yellow or cream-colored campanulate corolla persistent. Our species large, with loose, paniculate racemes; corolla lobes short, rounded, destitute of appendages. Seeds coarsely pitted; calyx lobes broadening downward; style deciduous.

1. *E. penduliflora* Benth. Trans. Linn. Soc. 17:281 (1834).

Villous pubescent or somewhat viscid, 2 or more dm. high; leaves pinnatifid the lobes numerous, short, somewhat toothed or incised; pedicels filiform as long as the at length nodding flowers, sometimes branched at the base; stamens almost free from the broadly campanulate withering corolla; ovules about 16.

In dry hillside fields, general. May to July. On the ridge between Rock Spring and Rock Falls cañons, *Nuttall* 254, 662; *Smith* 5070; *Mrs. Howland*. *Mrs. Trask* (U. S., Field). WHISPERING BELLS.

5. ERIODICTYON Benth.

Low shrubs with alternate pinnately veined and finely reticulated leaves of firm or coriaceous texture their margins mostly beset with rigid teeth, tapering at the base into more or less of a petiole; inflorescence a scorpioid cyme forming a terminal, usually naked thyrsus. Sepals narrow, not enlarging toward the apex, corolla violet or purple sometimes white. Filaments adnate variably and sometimes extensively to the tube of the corolla, usually sparsely hirsute. Ovary nearly or completely 2-celled by the meeting of the dilated placentae in the axils. Capsule small, ovate-globose, pointed.

1. *E. Traskiae* Eastw. Proc. Calif. Acad. Sci. 1, 3:131, t. X, f. 2 (1898).

Eriodictyon tomentosum of the Brandegee and Lyon lists.

Eriodictyon crassifolium Benthamianum Traskiae Brand Pflanz. 59:140 (1913).

Shrub 1-2 m. tall with reddish-brown branches and densely white-

tomentose leaves. Leaves rigid, ovate-lanceolate to narrowly lanceolate broadest at the upper third, narrowing to their insertion, blunt pointed the margin crenate or rather deeply open serrate, 8-18 x 1-1.75 cm.; inflorescence openly thyrsoid the lower peduncles leaf-bracted at the base the upper linear-bracted; flowers in dense scorpioid clusters, pedicelled; calyx densely hirsute, deeply lobed, the lobes narrowly linear, equal, 5 mm. long; corolla 7 mm., cylindrical, inflated at the middle, 5-angled, slightly pilose on the angles; lobes orbicular-ovate; filaments adnate throughout their length reaching to the middle of the tube. Ovary globose, glabrous; styles 2, free to the base, stigma capitate.

Dry volcanic uplands. Endemic. June. Base of Black Jack Mountain, alt. 1400 ft., *Trask* (N. Y.; Field); *McClatchie* (N. Y.; Field); *Lyon* 69 (Gray; Field); *Trask* (U. S.; Field); *Nuttall* 638; *Knapp* 95 (This is doubtless the type locality of *Mrs. Trask* who says: "Just at the foot of one of our highest peaks where it covers a large area; I have seen it in no other locality"); South End Mountains and near White's Landing, *Smith* 5098, 5169.

Family 5. POLEMONIACEÆ.

PHLOX FAMILY

Herbs or rarely shrubs with bland colorless juice, simple or divided leaves and no stipules, perfect and regular 5-merous flowers except that the free ovary is trimerous (3-celled with the placentae in the axis); the persistent calyx imbricated and the corolla dextrorsely convolute (and not plicatae) in the bud; the fruit a 3-celled loculicidal capsule usually with a thick placental axis; the few or many seeds small, amphitropous or nearly anatropous with a thin or soft coat commonly developing mucilage when wetted; the embryo straight and rather large in the axis of a fleshy or harder albumen, the cotyledons flat or flattish and rather broad. Stamens on the corolla alternate with its lobes distinct; style 1, 3-lobed or cleft, the introrse stigmas or lobes of the style stigmatic down the inner face, slender. Hypogynous disk generally manifest. The corolla is not always perfectly regular and the 5-stamens are very commonly unequal in length or insertion.

Calyx teeth equal.
 Calyx teeth unequal.

1. *GILIA*.
 2. *NAVARRERIA*.

1. *GILIA* Ruiz. & Pav.

Corolla funnelform, salverform or sometimes short-campanulate or rotate, regular; stamens equally inserted in the tube or throat of the corolla, the mostly slender filaments sometimes unequal in length, not declined. Ovules or seeds several or few, or rarely solitary in each cell; seed coat with few exceptions mucilaginous, in many with

uncoiling spiral threads, when wetted. Herbs or suffrutescent plants with either opposite or alternate and simple or compound leaves. Many species with showy flowers.

Inflorescence generally capitate.

Cells of the ovary 1 (rarely 2) ovuled:

Stamens never exceeding the corolla limb.

1. *Traskiae*.

Stamens exceeding the corolla limb.

2. *glutinosa*.

Cells of the ovary several ovuled:

Capsule oblong.

3. *Nevinii*.

Capsule ovoid.

4. *multicaulis*.

Inflorescence monoflorous (not capitulate):

Cells of the ovary many-ovuled:

Corolla lobes erose-dentate.

5. *dianthoides*.

Corolla lobe margin entire.

6. *bicolor*.

1. **G. *Traskiae*** Eastw. Milliken Rev. Calif. Polemon. 26 (1904).

Stem glandular 20-30 cm. high, branching from the base; leaves deeply pinnatifid to the rachis, segments oblong, entire or dentate. Corolla hypocrateriform or tubiform white twice as long as the calyx, lobes as long as the tube. Seeds not mucilaginous when wetted.

Grassy slopes. April and May. Endemic. *Mrs. Trask* 5 (1895).

2. **G. *glutinosa*** (Benth.) Gray Syn. Flora N. A. II, 1 suppl.: 408 (1886).

Collomia glutinosa Benth. Bot. Reg. 19:t.1622 (1833).

Gilia gilioides Milliken Rev. Calif. Polemon. 26 in part (1904).

Stem erect divaricately branching silvery long-hispid, glandular above 25-30 cm. high. Lower leaves lyrate-pinnatifid or pinnate the largest 4 x 1.75 cm.; the segments pinnatisect; the upper sessile, tripartite to the base. Corolla light-blue, hypocrateriform, 6-7 mm. broad the tube longer than the ovate, pointed lobes; Calyx shorter than the corolla tube, lobes linear-lanceolate, acute; stamens of various lengths some exceeding the corolla to which they are affixed slightly below the middle of the tube and continued to the base by 5 hairy lines; ovary oblong-ovate, 1-2-ovuled in each cell; stigma slender, much shorter than the stamens; styles short, hairy, recurved; seeds black, wrinkle-pitted.

Dry upland hillsides. June to July. Vicinity of Avalon, *Brandegee*, *Trask*, *Carlson*, *Eastwood* 6456; Head of Cañon opposite Chicken Johnny's, *Nuttall* 339, 608, and roadside beyond the Saw Mill 244.

3. **G. *Nevinii*** Gray Syn. Flor. N. A. II, 1 suppl.: 411 (1886).

Stem simple or branched, glandular pubescent, densely foliate, 8-50 cm. high; leaves 2-3-pinnatifid, the lower long-petioled; flowers in few-flowered cymose heads, densely glandular-viscid; corolla 12 mm. long, short-tubed, about twice the length of the calyx, deep blue or purple, not maculate in the throat, lobes about twice the length of the tube; filaments short, inserted in the throat just below the corolla sinuses. Capsule oblong.

Open grassy hillsides. March to May. *Nevin & Lyon* (Gray, type; photo. Field); *Trask*; Gallagher's Cañon, *Millsp.* 4862; Road up East Hill, Avalon, *Nuttall* 103.. *Trask*, (U. S.; Field); *Brandegee* list; Pacific Slope of the Salta Verde, *Knopf* 343; Banning's Canyon, *Knopf* 88. TURQUOISE FLOWER.

4. **G. multicaulis** Benth. Bot. Reg. 19: t. 1622 (1833).

Gilia multicaulis alba Milliken Rev. Calif. Polemon. 35 (1904).

Stem erect 15-30 cm. tall; leaves 2-3-pinnatifid, puberulent, segments linear; flowers in open, 3-many flowered terminal cymes, at first subsessile becoming short-pedicelled; calyx and pedicel glandular, campanulate, the lobes narrow, apiculate, hyaline-margined, about the length of the tube; corolla blue, sometimes white, infundibuliform, twice or more the length of the calyx, throat broad, lobes about twice the length of the tube. Filaments short, attached to the throat of the corolla much shorter than the limb; style somewhat longer than the corolla, stigmas short, revolute; ovules many in each cell. Capsule ovoid; seeds brown.

Open grassy places. March to June. Cherry Cañon, *Smith* 5086; Fisherman's Cove, *Trask*, *Millsp.* 4922; Chicken Johnny's, *Nuttall* 142. *Lyon*, *Brandegee*.

5. **G. dianthoides** Endl. Atakt. Bot. t. 29 (1833).

Linanthus dianthiflorus Greene Pitt. 2: 254 (1892).

Fenzelia dianthiflora Benth. Bot. Reg. 19: t. 1622 (1833).

Fenzelia speciosa & concinna Nutt. Jour. Acad. Nat. Sci. Phil. I, 1: 157 (1847).

Stem erect, simple or branched, puberulent, 3-12 cm. or more; leaves filiform, glabrous or slightly canescent; flowers fragrant, terminal, solitary or 2-6, short pedicelled; calyx tubular-campanulate the teeth much longer than the tube; corolla light-lilac or rose-purple sometimes white, petals suborbicular, yellow at the throat purple at the base, about twice as long as the calyx, erose-dentate at the apex. tube short; stamens affixed just above the base of the corolla, included; styles as long as the calyx and its lobes; stigmas filiform one-quarter the length of the style; capsule as long as the calyx-tube, many seeded, seeds orbicular, smooth.

On arid heights (*Trask*) and grassy slopes. March to April. Hillside near Fisherman's Cove, March 14, 1920, *Millsp.* 4785 (here the plants were all simple stemmed and almost all the flowers pure white: a few pale-lilac ones were seen); *Brandegee*; *Gambel*; Salta Verde, *Knopf* 364.

6. **G. bicolor** (Nutt.) Brand Pflanzenr. 4, 250: 139 (1907).

Leptosiphon bicolor Nutt. Trans. Acad. Nat. Sci. Phil. II, 1: 156 (1848).

Stem slender, often simple, finely puberulent; Leaves whorled, 3-5-partite, segments linear-lanceolate or linear. Inflorescence solitary or at times 2-3-flowered; calyx eglandular, the segments narrow, 3-veined, about 7 mm. long, ciliate, much longer than the tube; corolla smooth, violet or white with a bright yellow "eye," the tube long

and slender nearly three times the length of the calyx, lobes ovate, small, about five times shorter than the tube; filaments about three times the length of the anther; ovary lenticular; style much shorter than the corolla tube.

Grassy hillsides. March to May. Fisherman's cove, *Trask*; March 14, 1920, *Millsp.* 4784 (Probably *Mrs. Trask's* station as it was found by me near her "Isthmus Home" now in ruins); Moonstone Beach, *Knopf* 379.

2. NAVARRETIA Ruiz. & Pav.

Annual viscid herbs with alternate, entire or pinnatifid leaves the divisions of which are spinose. Inflorescence in more or less densely flowered involucrate heads with very various bracts. Calyx obconic or tubulo-campanulate, 5- rarely 4-fid, lobes, unequal, or all entire or partly 1-many toothed; corolla small tubiform or infundibuliform about twice as long as the calyx, lobes slender much shorter than the tube; stamens 5 rarely 4, equally or unequally affixed sometimes included sometimes exserted; style equalling or shorter than the corolla; stigmas 2 or 3; ovary 2 or 3 celled; cells 1-many seeded. Capsule variable both in the character of its pericarp and method of dehiscence; seeds 1-many, sometimes mucilaginous sometimes unaffected by wetting.

Flower-heads not woolly.

Terminal leaf lobe equal to lateral:

Calyx dilated at the middle.

1. foliacea.

Calyx not dilated at the middle:

Leaf-rachis 3-5 mm. broad.

2. atractyloides.

Leaf-rachis about 1 mm. broad.

3. hamata.

Terminal leaf lobe longer than lateral.

4. viscidula.

Flower-heads woolly.

5. filifolia.

1. *N. foliacea* Greene Pitt. 1:138 (1887).

Diffusely branching from the base, densely leafy, about 15 cm. high, the stem densely viscid glandular. Leaves elliptical or oblong the segments herbaceous below, spinose at the apex. Inflorescence in dense, bracted, terminal heads, the outer bracts similar to the leaves; calyx ventrically dilated, lobes plainly unequal 2 large, ovate-acuminate and more or less recurved, 3 small and tooth-like; corolla white, 8 mm. long exceeding the calyx, tube narrow, dilated above, the lobes oblong much shorter than the tube; stamens unequally affixed to the throat, the upper somewhat exserted; style shorter than the tube; cells of the ovary 4-5-ovuled.

Dry, open situations. June. In the outer enclosure at Chicken Johnny's, *Nuttall* 349, 830; *Pendleton* 1392.

2. **N. atractyloides** (Benth.) Hook & Arn. Bot. Beechey 368 (1840).
Aegochloa atractyloides Benth. Bot. Reg. 19:t. 1622 (1833).
Gilia atractyloides Steud. Nom. ed. 2, 1:683 (1840).

Very rigid especially the leaves and bracts, pubescent and very viscid; bracts lanceolate or the uppermost even ovate all pinnatifid and with divaricate subulate spinescent lobes the rachis 3-5 mm. broad. Flowers less glomerate than those of *viscidula*. Capsule oblong; seeds 6 in each cell, brown, very mucilaginous when wetted.

Open, dry situations. June to July. Reported in both the *Brandegee* and *Lyon* lists. The *Brandegee* specimen in herb. Field Museum and the *Lyon* and *Nevin* in herb. Gray prove to be *N. hamata* Greene. We have not collected the species, though it is doubtlessly properly credited to the Island.

3. **N. hamata** Greene Pitt. 1:139 (1887).

Stem slender, glandular, simple or much branched from the base, 4-16 cm. high. Lower leaves doubly, upper singly, spinose, rachis 1 mm. broad, divisions very rigid, always reflexed. Heads small, terminal; bracts broadly leafy; calyx lobes subulate spined; corolla purple, tube narrow, long exserted, dilated at the throat, lobes much shorter than the tube. Stamens attached to the throat of the corolla and shorter than the lobes; style as long as the tube. Capsule subglobose, about 9-seeded; seeds brown, finely reticulate-pitted, not changed in water.

Dry slopes and Cañon washes. May to June. Pebble Beach Cañon, *Nuttall* 186, Equestrian Trail 265, 321, Middle Ranch Creek bed, 663 hillside at head of Grand Cañon 708. *Brandegee* (*Gilia atractyloides* in herb. Field Museum), *Mrs. Howland*; *Lyon & Nevin*; *Trask*.

4. **N. viscidula** Benth. Pl. Hartweg 324 (1848).
Gilia viscidula Gray Proc. Am. Acad. 8:271 (1870).

Stem divaricate branched, glandular-viscid or the lowest portion glabrous, 5-25 cm. high; lobes of the intermediate leaves triangular acuminate at the base, always 1-2-denticulate. Corolla more than twice the length of the calyx, tubular or infundibuliform; stamens slightly exserted; style as long as the corolla. Capsule half as long as the calyx, 2-4-seeded; seeds slightly mucilaginous when wetted.

Dry slopes. June and July. *Brandegee*: *Trask*; *Macbride & Payson* 836. Not seen by us.

5. **N. filifolia** (Nutt.) Brand Pflanzenr. 4, 250:167 (1907).
Gilia filifolia Nutt. Jour. Acad. Sci. Phila. n. s. 1:156 (1848).
Navarretia filifolia eu-filifolia Brand *ibid*.

Stem erect, simple or virgate branching from the base, smooth or the younger parts white-tomentose, 5-20 cm. high. Leaves filiform, entire or 3-parted at the base. Heads densely white-woolly, bracts 2-5-parted, more or less recurved, the base hyaline; calyx densely woolly, lobes unequal, subulate, shorter than the tube; corolla blue, hypocrateriform, somewhat longer than the calyx, lobes much shorter

than the tube; stamens attached below the throat, slightly exerted; ovary cylindrical-ovate, very minutely ciliate, cells 4-ovulate, style as long as the corolla tube. Seeds densely spirilliferous in water.

Dry hillsides. April to May. *Trask*; on the hill beyond the Avalon School House, April 29, 1920, *Nuttall 32, 1210*.

Family 6. SOLANACEÆ.

POTATO FAMILY

Herbs, shrubs, vines, or some tropical species trees, with alternate or rarely opposite estipulate leaves, and perfect regular, or nearly regular, cymose flowers. Calyx inferior, mostly 5-lobed. Corolla gamopetalous, mostly 5-lobed, the lobes induplicate-valvate or plicate in the bud. Stamens as many as the lobes of the corolla and alternate with them, inserted on the tube, all perfect in the following genera; anthers various, 2-celled, apically or longitudinally dehiscent. Ovary superior, 2-celled (rarely 3-5-celled); ovules numerous on the axile placenta, anatropous or amphitropous; style slender, simple; stigma terminal; fruit a berry or capsule. Seeds numerous; endosperm fleshy; cotyledons semiterete.

Fruit a berry:

Corolla plicate.

Corolla not plicate.

Fruit a capsule:

Calyx tubular.

Calyx ovoid or campanulate.

1. SOLANUM.

2. LYCIUM.

3. DATURA.

4. NICOTIANA.

1. SOLANUM Linn.

Herbs or shrubs, often stellate-pubescent, sometimes climbing. Flowers cymose, umbelliform paniculate, or racemose. Calyx campanulate or rotate, mostly 5-toothed or 5-cleft. Corolla rotate, the limb plaited, 5-angled or 5-lobed, the tube very short. Stamens inserted on the throat of the corolla; filaments short; anthers linear or oblong, acute or acuminate, connate or connivent into a cone, each sac dehiscent by a terminal pore, or sometimes by a short introrse terminal slit, or sometimes also longitudinally. Ovary usually 2-celled; stigma small. Berry mostly globose, the calyx either persistent at its base or enclosing it.

Puberulent with scattered hairs, fruit small.

Densely pubescent with glandular hairs, fruit large.

1. Douglasii.

2. Wallacei.

1. *S. Douglasii* Dunal, DC. Prodr. 13, 1:48 (1852).

Usually somewhat woody, 1-2 m. high; stems angular, the angles

somewhat denticulate-scabrous, otherwise more or less puberulent; leaves variously angular-dentate, or some nearly entire; umbels nearly opposite the leaves, several-flowered; flowers white or pale purplish, 8-14 mm. broad, pubescent without, deeply 5-parted, the lobes lanceolate; anthers yellow, 4-5 mm. long; filaments about 1 mm. long, stout, hairy, nearly equaling the slender style; fruit black.

Common everywhere on canyon slopes and bottoms. Flowers the year around. *Lyon*; *Brandegee*; *Trask* (as *S. nigrum* var.); *Smith* 5005; *Millsp.* 4476, 4514, 4606, 4707, 4719; *Nuttall* 35, 139, 203, 494, 703; *Knopf* 65, 180, 188, 198, 220, 236, 239, 278. NIGHTSHADE.

We have collected this species largely, in order to omit no possible form of significance. The plants differ considerably in leaf form and dentation and in color of flowers, the differences being racial and mostly due to soil and exposure. Plants growing in water, deep in canyons, have entire leaves and larger flowers.

2. *S. Wallacei* (Gray) Parish, Proc. Calif. Acad. 3, 2: 166 (1901)

Solanum Xanti Wallacei Gray, Proc. Am. Acad. 11:90 (1876).

Suffrutescent, often forming large rounded masses and growing up to 2 m. high; stems about a meter long, densely tawny-villous with long, multilocular, viscidly glanduliferous hairs which are unbranched, or usually a few once-branched; leaves thickish, sometimes pustulose, usually less densely villous than the stems, crenate margined, the lower ample, cordate, the upper ovate, rounded, or subcordate at base; calyx narrowly funnel-form, deeply cleft, or wider and less deeply divided; corolla 2-4 cm. wide; style glabrate, or villous below; ripe fruit dark purple.

In canyon bottoms where it grows up among shrubs to a height of 7 feet or more or forms large masses with a wealth of bright blue flowers often fully 2 inches across and leaves up to 3.5 x 6 inches. It blooms throughout the year. *Wallace* (Type); *Lyon* 76; *Trask*; *Brandegee*; *Hasse*; *McClatchie*; *Grant* 1220; *Grant & Wheeler* 6141; *Smith* 5045; *Pendleton* 1366; *Reed* 2819; *Pebble Beach*, *Millsp.* 4522, *Nuttall* 76, *Knopf* 112, *Macbride & Payson* 846; *Hamilton Canon*, *Nuttall* 704, 1134; *Middle Ranch Canyon*, *Knopf* 257 and *Echo Lake* 77. GIANT SOLANUM, WILD TOMATO.

Lyon remarked that the large purple-black fruit is edible, but *Mrs. Trask* says: "Vincente, an old-time island fisherman, can eat two or three fruits without ill effect though his two little boys became quite ill in consequence of eating them." *Mr. Knopf* writes that "Mexican Joe took a visitor to White's Landing in his boat. When they landed the man found some of the ripe fruit and, mistaking it for 'Ground Cherry,' which he was of the habit of eating elsewhere, ate a number despite Joe's warning. In a few minutes he was taken with violent cramps. They started for Avalon, and on the way the man went into convulsions. The run to Avalon took 40 minutes, and by the time they had arrived violent purging placed him out of danger. Its effect was similar to an overdose of epsom salts or croton oil, only that the solanum caused the cramps and convulsions."

2. LYCIUM Linn.

Shrubs, or woody vines, often spiny, with small alternate entire leaves, commonly with smaller ones fasciated in their axils, and white greenish or purple. solitary or clustered flowers. Calyx campanulate,

3-5-lobed or -toothed, not enlarged in fruit, persistent. Corolla-tube short or slender, the limb 5-lobed (rarely 4-lobed), the lobes obtuse. Stamens 5 (rarely 4); filaments filiform, sometimes dilated at the base; anther-sacs longitudinally dehiscent. Ovary 2-celled; style filiform; stigma capitate or 2-lobed. Berry globose, ovoid, or oblong.

1. **L. californicum** Nutt. Gray Bot. Calif. 1:542 (1876).

Glabrous, very much branched, 6.8-12.2 dm. high: branchlets spinescent: leaves thick and fleshy, very small, in the fascicles 2.1-4.2 mm. long, from oval or obovate to oblong or spatulate, or on vigorous shoots 6.3 mm. long and almost linear: flowers nearly sessile or on pedicels of 2.1-4.2 mm. in length: tube of the white corolla included in the campanulate 4-toothed calyx, its 4 oval rotately spreading lobes hardly 2-1 mm. long.

Dry banks near the sea. January to May. *Lyon*; *Brandegee*; Isthmus Cove, *Trask*, *Millsp.* 4778, *Nuttall* 258; Catalina Harbor along the "break-off" of the shore, *Reed* 2857, *Pendleton* 1421, *Millsp.* 4612; Pacific slope of the Salta Verde, *Knopf* 332. BOX THORN.

[**L. Richii** Gray. There was once a large growth of this Mexican species in Avalon "one hundred feet in circumference and twenty-five high," on specimens from which *Dr. Greene* based his species *Lycium Hassei*. From this growth *Lyon*, *Trask*, *Hasse*, *Brandegee*, *Mrs. Wheeler*, *Toumey*, *McClatchie* and others made and distributed specimens. In 1908 this famous growth had been destroyed to make way for buildings. MATRIMONY VINE.]

3. **DATURA** Linn.

Tall narcotic herbs, some tropical species shrubs or trees, with alternate petioled leaves, and large solitary erect, short-peduncled, white purple or violet flowers. Calyx elongated-tubular or prismatic, its apex 5-cleft or spathe-like, in the following species circumsessile near the base which is persistent and subtends the prickly capsule. Corolla funnelform, the limb plaited, 5-lobed, the lobes broad, acuminate. Stamens included or little exserted; filaments filiform, very long, inserted at or below the middle of the corolla-tube. Ovary 2-celled, or falsely 4-celled; style filiform; stigma slightly 2-lobed. Capsule 4-valved from the top, or bursting irregularly.

1. **D. meteloides** DC. Dunal DC. Prodr. 13, 1: 544 (1852).

Perennial, pale, being coated with a very minute and soft whitish pubescence, from 3.3-12.2 dm. high: leaves mostly only repand or entire: calyx 3 and corolla 17-20 cm. long; the latter white or suffused with violet, the widely expanded border with 5 (not 10) slender-

subulate conspicuous teeth: capsule 5 cm. in diameter, thickly beset with short and weak equal prickles: seeds bordered by a narrow and uniform cord-like margin.

On lowland flats at the mouths of the larger canyons. June. Avalon Valley, *Brandegee, Carlson*; Rock Spring Canyon, *Nuttall 347*. BELL FLOWER.

4. NICOTIANA Linn.

Viscid-pubescent narcotic herbs or shrubs, with large alternate entire or slightly undulate leaves, and white, yellow, greenish or purplish flowers, in terminal racemes or panicles. Calyx tubular-campanulate or ovoid, 5-cleft. Corolla-tube usually longer than the limb, 5-lobed; the lobes spreading. Stamens 5, inserted on the tube of the corolla; filaments filiform; anther-sacs longitudinally dehiscent. Ovary 2-celled (rarely 4-celled); style slender; stigma capitate. Capsule 2-valved, or sometimes 4-valved at the summit. Seeds numerous, small.

Herb, viscid pubescent.
Tree, glaucous.

1. *Bigelovii*.
2. *glauc*.

1. *N. Bigelovii* Wats. Bot. Calif. 1:546 (1876).

Leaves oblong or oblong-lanceolate (10-15 cm. long, or the uppermost smaller), only the lower ones petioled; some of the upper often with broader and partly clasping base: flowers scattered: teeth of the calyx linear-lanceolate and surpassing the ovate 4-valved capsule: corolla nearly salverform, with tube 3.8 cm. long, and a 5-cleft border of 2.6 cm. or more in diameter, its lobes triangular and acute.

In loam and silt, infrequent. May to June. *Brandegee* (as *N. Clevelandi*); Pebble Beach Road, *Smith 5064*; Pebble Beach Canyon, *Knopf 109*. WILD TOBACCO.

2. *N. glauca* Grah. Edin. N. Phil. Jour. Apr.-June 175 (1828).

Soft-woody evergreen shrub 1.8-4.5 m. high, very slender and loosely branching, with glabrous and glaucous herbage; leaves ovate, entire, 20 cm. long, on petioles 10 cm. long; uppermost leaves reduced, ovate to oblong; flowers in terminal panicles; calyx unequally 5-toothed, 3.8 cm. long; corolla 3.8 cm. long, its tube dilated above summit of the calyx, the stamens inserted at this point; throat of corolla constricted just below the short shallowly 5 (occasionally 4)-lobed limb; anthers and stigma in throat of corolla; ovary seated on a yellowish disk; capsule oblong, 12.7 mm. long.

In canyons and fringing the high ridges. Blooming throughout the year. Fisherman's Cove, *Trask*; Avalon vicinity, common, *Macbride & Payson 845*. *Pendleton 1390*, *Millsp. 4474*, *Nuttall 25*; Summit, *Smith 5016*; Pebble Beach and Hamilton Canyons, *Knopf 66, 209, 271*. MEXICAN TOBACCO, TREE TOBACCO, INDIAN TOBACCO.

Mrs. Trask found in the summer of 1896 at Fisherman's Cove, a single specimen of this very troublesome weed, which now fills the level mouths of most all of the larger canyons in jungle-like masses; and fringes the higher ridges throughout the island. We learned that previous to a great conflagration on the mainland across the channel (in about 1902), that this tobacco was hardly known on the island. The fishermen say that a dense cloud of smoke came over the island and that two or three years afterward the plant was abundant on the highest ridges and in all the channelward canyons.

Family 7. SCROPHULARIACEÆ.*

FIGWORT FAMILY

Herbs, shrubs or trees, with estipulate leaves, and perfect, mostly complete and irregular flowers (corolla wanting in one species of *Synthyris*). Calyx inferior, persistent, 4-5-toothed, -cleft, or -divided, or sometimes split on the lower side, or on both sides, the lobes or segments valvate, imbricate or distinct in the bud. Corolla gamopetalous, the limb 2-lipped, or nearly regular. Stamens 2, 4 or 5, didynamous, or nearly equal, inserted on the corolla and alternate with its lobes; anthers 2-celled; the sacs equal, or unequal, or sometimes confluent into one. Disk present or obsolete. Pistil 1, entire or 2-lobed; ovary superior, 2-celled, or rarely 1-celled; ovules anatropous or amphitropous, on axile placentæ; style slender, simple; stigma entire, 2-lobed or 2-lamellate. Fruit mostly capsular and septicidally or loculicidally dehiscent. Seeds mostly numerous; endosperm fleshy; embryo small, straight or slightly curved; cotyledons little broader than the radicle.

Leaves opposite, upper sometimes alternate:

Corolla spurred or saccate at base:

Corolla tube spurred.

1. LINARIA.

Corolla tube saccate:

Palate not closing the throat.

2. GAMBELIA.

Palate closing the throat.

3. ANTIRRHINUM.

Corolla without spur or sac:

Fifth stamen only a filament or scale:

Fifth stamen a scale.

4. SCROPHULARIA.

Fifth stamen a filament.

5. PENTSTEMON.

Fifth stamen wanting entirely:

Capsule opening down one side.

6. DIPLACUS.

Capsule opening at apex.

7. MIMULUS.

Leaves alternate:

Sepals united into a cleft calyx:

Calyx 2-cleft.

8. CASTILLEJA.

Calyx 4-cleft.

9. ORTHOCARPUS.

1. LINARIA Hill.

Herbs, some exotic species shrubby, with alternate leaves, or the lower and those of sterile shoots opposite or verticillate, the flowers in

*By F. W. Pennell.

terminal bracted racemes or spikes or axillary. Calyx 5-parted, the segments imbricated. Corolla irregular, spurred at the base, 2-lipped, the upper lip erect, 2-lobed, covering the lower in the bud, the lower spreading, 3-lobed, its base produced into a palate often nearly closing the throat. Stamens 4, didynamous, ascending, included; filaments and style filiform. Capsule opening by 1 or more mostly 3-toothed pores or slits below the summit. Seeds numerous, angled or rugose.

1. **L. canadensis texana** (Scheele) Pennell. Proc. Acad. Nat. Sci. Phila. 73³:502 (1922).
Linaria texana Scheele, Linnæa 21:761 (1848).

Biennial or annual, glabrous; flowering stems erect or ascending, very slender, 1-8 dm. high; sterile shoots procumbent, leafy. Leaves linear or linear-oblong, 8-30 mm. long, entire, sessile, those of the sterile shoots, or some of them, usually opposite; flowers 6-8 mm. long, in slender racemes; pedicel appressed in fruit; calyx-segments lanceolate, acute, or acuminate, about as long as the capsule; spur of the corolla as long as the tube or longer; palate a white convex 2-ridged projection; seeds wingless.

Differs from the species, as here described, primarily by roughness of seeds which however varies from a few roughenings on the side to densely tuberculate.

Fields and open places. March to June. Avalon, *Trask*; *Brandegec*; Equestrian Trail, *Nuttall* 155, 492, 699; Salta Verde, *Knopf* 342. BLUE TOADFLAX.

[*Linaria* sps. Three long, tenuous spurred linarias, a purple-, a yellow- and a white-flowered species have established themselves on the west slope of Descanso Canyon (*Mills* 4698, 4699, 4834; *Davidson*) escaping from cultivation in the grounds of the St. Catharine Hotel.]

2. **GAMBELIA** Nutt.

A spreading bush, with verticillate, entire, coriaceous leaves, and axillary and terminal conspicuous scarlet flowers. Allied to *Galvezia*, but with a prominent palate and a saccate spur at the base of the corolla. Calyx 5-parted, nearly equal. Corolla hypogynous, the tube cylindrical, saccate at the base, orifice narrowly pervious, the border bilabiate, the palate rather prominent, smooth, upper lip erect; the lower spreading, all the segments nearly equal and oblong. Stamens four, arising from the base of the corolla tube, included, didynamous: no sterile filament: anthers bilocular, oblong. Ovary bilocular, with many ovules, seated upon a glandular torus. Style simple, clavate, entire. Capsule subglobose, 2-celled, opening below the summit by two or three irregular apertures. Seed (not seen).

1. *G. speciosa* Nutt. Jour. Acad. Nat. Sci. Phila. ns. 1:149 (1848).
Antirrhinum speciosum Gray Am. Jour. Sci. 7:376 (1867).

Characters of the genus as above. Seeds pyriform, apiculate, dark-brown, 2.5×1.5 mm., sharply and interruptedly anastomose-ridged.

Wooded hillsides and cliffs. March to June. *Gambel type* (labelled "Catalina, T. Nuttall", in Herb. Phila. Acad.); *Lyon*; *Brandegee*; *Avalon*, *Trask* (in Herb. N. Y. Bot. Gard.); wooded hillside east of Isthmus Cove. *Mills* 4832; *Hall* 8289; *Reed* 2827; *Moonstone Beach*, *Knopf* 392.

3. ANTIRRHINUM Linn.

Herbs, with alternate leaves, or the lower and those of sterile shoots opposite, and red purple yellow or white flowers, in terminal racemes, or solitary in the upper axils. Calyx 5-parted, the segments imbricated. Corolla irregular, gibbous, or saccate, but not spurred, 2-lipped, the upper lip erect, 2-lobed, the lower spreading, 3-lobed, its base produced into a palate nearly or quite closing the throat. Stamens 4, didynamous, included. Style filiform. Capsule opening by chinks or pores below the summit. Seeds numerous, not winged.

Herbage glabrous. Leaves linear-lanceolate. Pedicels 40-60 mm. long, flexuous. Corolla 15 mm. long. Sepals uniform and capsule symmetrical.

1. *Hookerianum*.

Herbage pubescent. Leaves ovate to orbicular-ovate. Pedicels less than 20 mm. long. Posterior sepals longer, and capsule oblique.

2. *Nuttallianum*.

1. *A. Hookerianum* Millsp. *comb. nov.*

Maurandya stricta Hook. & Arn. Bot. Beech. Voy. 375 (1838).

Antirrhinum strictum A. Gray, Proc. Am. Acad. 7:375 (1868)
 non Sibth. & Sm. (1825).

Erect, nearly simple, 3-6 dm. high, somewhat pubescent below: lower leaves lanceolate, the upper linear, and the upper floral ones filiform; the latter much shorter than the tortuous racemose peduncles: corolla violet-purple, 12.7 mm. long, gibbous at base; the palate hairy; capsule crustaceous, tipped with a straight style of equal length.

Open bare or grassy places. April to June. Vicinity of *Avalon*, *Trask*; *Equestrian Trail*, *Nuttall* 247; mouth of *Pebble Beach Canyon*, *Knopf* 132, and *Moonstone Beach* 382.

2. *A. Nuttallianum* Bth. DC. Prodr. 10:592 (1846).

Viscidly soft-pubescent, or below glabrous, at length 3.3-6.8 dm. high and diffusely much branched; the tortile branchlets few or more leaf-bearing than in the preceding: leaves ovate or the lowest slightly cordate (2.6 cm. long), those of the branchlets gradually much diminished and nearly sessile: some of the lower peduncles longer than the

flowers, often tortile: sepals ovate or oblong, shorter than (or the broader upper one almost equaling) the tube of the corolla; this 4.2-6.3 mm. long, merely gibbous at base: capsule oblong: seeds sharply and strongly ribbed.

Shaded slopes. March to July. *Lyon*; sea cliffs east of Avalon, *Trask*, *Pendleton* 1401, *Reed* 2838, *Brandegee Schumacker* (as *A. subsessile*), *Nuttall* 697; Cherry Canyon, *Smith* 5084; near the summit of the Equestrian Trail, *Nuttall* 240, 491. SNAPDRAGON.

4. SCROPHULARIA Linn.

Perennial strong-smelling herbs, some exotic species shrubby, with mostly opposite leaves, and small purple greenish or yellow protogynous flowers, in terminal paniced cymes or thyrses. Calyx 5-parted or 5-cleft, the segments or lobes mostly obtuse. Corolla irregular, the tube globose to oblong, not gibbous nor spurred, the limb 5-lobed, the 2 upper lobes longer, erect, the lateral ones ascending, the lower spreading or reflexed. Stamens 5, 4 of them anther-bearing and didynamous, declined; their anther-sacs confluent into one, the fifth sterile, reduced to a scale on the roof of the corolla-tube. Style filiform; stigma capitate or truncate. Capsule ovoid, septicidally dehiscent. Seeds rugose, not winged.

1. *S. villosa* Pennell *sp. nov.*

Caulis 12-18 (-36) dm. altus, simplex vel superne ramosus. Foliorum laminæ usque ad 10-15 cm. longæ, acuminatæ, dentibus acutis triangularibus dupliciter serratæ, truncatæ ad subcordatæ et 8-12 cm. latæ ad basim, in petiolis 3-5 cm. longis. Inflorescentia angusta elongata paniculata, ramis (ut caulis apice, petiolis et calycibus) villosis, pilis tenuibus albis et glandulo atro coronatis. Sepala 2-3 mm. longa, ovata, acuta. Corolla 8-10 mm. longa, intense rubro-badia, segmentis duobus posterioribus ad intra circ. 1 mm. ab apice adnatis, emarginatione sinuum anteriorum in altitudine circ. $\frac{2}{3}$ corolla posita; totis segmentis angustis et corolla in partem distantem manifeste angustata. Antheræ exsertæ in filamentis quam corollæ tubo longioribus; filamento posteriore obsoleto vel tantummodo termino minuto libero vasculari. Capsula brunnea, perspicue acuminata, plerumque 5-9 mm. longa. Semina 4-6 mm. longa.

To be distinguished from *S. californica* Cham. of the mainland by the following contrast:

S. californica Pubescence consisting of minuate gland-tipped hairs. Inflorescence reaching 8-15 cm. wide, its primary branches at least 30 mm. long. Corolla reddish-brown, the anterior lobes deflexing from a point less than one half the length of the corolla. Posterior filament a scale as wide or wider than long.

S. villosa Pubescence consisting of slender gland-tipped hairs. Inflorescence reaching 5-8 cm. wide, its primary branches less than 30 mm. long. Corolla deep maroon, the anterior lobes deflexing from a point about two-thirds the total length of the corolla. Posterior filament obsolete or only a minute awn-like projection.

In the bottoms of canyons. January to June. *Lyon; Brandegee; Trask; Grant 1186; Eastwood 6481; Pebble Beach Canyon, Moxley 731; Knopf 182. Boughton; foot of the Equestrian Trail, Millsp. 4558, Nuttall 162 (type), 696. FIGWORT.*

Previously reported by all collectors as *S. californica*. Brandegee says (*Zoe* 1:112): "Seems quite different from the well-known mainland form on account of the development of long, spreading, white hairs, especially abundant on the panicle, giving it a really handsome appearance." Mrs. Trask says (*Erythea* 7:140): "Beset with long glistening hairs. Its virgate flowering branches are two feet long and rise from four to six feet above one's head." The authors noted that the inflorescence glistened like glass, or as if covered with hoarfrost; or, as Mrs. Trask appends to her label, "like silver candelabra."

5. PENTSTEMON Schmid.

Perennial herbs, mostly branched from the base only, with opposite or rarely verticillate leaves, or the upper occasionally alternate, and large, blue purple red or white flowers, in terminal thyrses, panicles, or racemes. Calyx 5-parted, the segments imbricated. Corolla irregular, the tube elongated, more or less enlarged above, the limb 2-lipped; upper lip 2-lobed; lower lip 3-lobed. Stamens 5, included, 4 of them antheriferous and didynamous, the first sterile, as long as or shorter than the others; anther-sacs divergent or connivent. Style filiform; stigma capitate. Capsule ovoid, oblong, or globose, septically dehiscent. Seeds, numerous, wingless.

1. *P. cordifolius* Bth. Scroph. Ind. Introd. 7 (1835).

Scrambling over bushes by long sarmentose branches 6-15 dm. in height, scabrous-puberulent, very leafy: leaves somewhat cordate, or some ovate with a truncate base, mostly acute and serrate or denticulate with sharp salient teeth: the veins impressed on the upper and prominent on the lower face: flowers in a somewhat leafy panicle; peduncles divaricate: calyx-lobes ovate-lanceolate: corolla scarlet (3.8 cm. long, the upper lip over 12 mm.).

Open washes and canyon beds. February to July. *Lyon; Wallace; Trask; Brandegee; Avalon Valley, Eastwood 6483, Pendleton 1435, Reed 2830, Heller 8951, Millsp. 4651; Rock Spring Canyon, Smith 5103; Big Wash Canyon and Schoolhouse Ridge, Nuttall 875, 44; Pebble Beach Canyon, Knopf 179. CORAL VINE, CORAL STRING.*

6. DIPLACUS Nutt.

Low evergreen glutinous shrubs, with opposite leaves which are

revolute in the bud, and large red, orange or salmon-colored flowers, solitary in the axils. Calyx tubular, 5-angled and 5-toothed, Corolla with funnellform tube and rather broad bilabiate limb. Stamens 4. Stigma of 2 flat lobes closing together when irritated. Capsule firm, coriaceous, opening down the upper suture only, the valves spreading out nearly flat.

1. *D. linearis* (Bth.) Greene, Pitton. 2:156 (1890).

Mimulus linearis Bth. Scroph. Ind. Introd. 27 (1835).

Shrubby, 6-18 dm. high, nearly glabrous or minutely pubescent: leaves from narrowly oblong to linear-lanceolate or linear, and from minutely dentate to nearly entire (2-10 cm. long), the margins inclined to be revolute: peduncles in the axils of the leaves, either a little or much shorter than the narrow prismatic calyx: corolla 3-5 cm. long, in the typical form buff or salmon-color; other races red, red-brown, scarlet, orange, or deep maroon; the lobes either crose-toothed or emarginate.

Apparently a polymorphous species of many races; here understood to include *D. puniceus* Nutt. and perhaps not specifically distinct from the broader-, usually serrate-leaved *D. glutinosus* (Wendl.) Nutt. of the mainland.

Canyons and washes. Blooms throughout the year. Avalon Valley, Lyon, Trask, Brandegee (as *Mimulus glutinosus*), Pendleton 1360, Reed 2816, Fisher, Carlson, Smith 5012, Hasse, Rusby, Toumey, Moxley 694, Millsp. 4546; Rock Spring Canyon, Golf Links Canyon and Big Wash Canyon, Nuttall 124, 79, 1008; Descanso Canyon, Millsp. 4499; Summit, alt. 1300 feet, Nuttall 320; Silver Canyon, Smith 5107; Middle Ranch Canyon, Nuttall 301; Echo Lake, Knopf 52. STICKY MONKEY FLOWER.

7. MIMULUS Linn.

Herbs, with opposite leaves. Flowers axillary, solitary, peduncled, pink, violet, or yellow. Calyx prismatic, 5-angled, 5-toothed. Corolla irregular, its tube cylindric with a pair of ridges on the lower side within, its limb 2-lipped; upper lip 2-lobed; lower lip spreading, 3-lobed, the lobes rounded. Stamens 4, didynamous; anther-sacs divergent, or sometimes confluent at the summit. Style filiform; stigma 2-lamellate. Capsule loculicidally dehiscent, many-seeded, enclosed by the calyx.

Corolla yellow:

Calyx-lobes uniform. Corolla 9-14 mm. long.

Stem hirsute.

1. floribundus.

Calyx-lobes unequal, the posterior longest. Corolla

25-30 mm. long. Stem glabrous.

2. guttatus.

Corolla red:

Corolla 40-50 mm. long, anthers villous. Leaves sessile, serrate.

3. cardinalis.

Corolla 15-20 mm. long, anthers glabrous.

Leaves petiolate, entire or minutely toothed. 4. Traskiae.

1. **M. floribundus** Lindl. Bot. Reg. 13. t. 1125 (1827).

Annual, erect or with numerous ascending branches, 22-44 cm. high, flowering from the base: leaves ovate (12-20.6 mm. long), the lower slightly cordate: upper peduncles longer than the leaves: calyx short-campanulate, becoming ovate in fruit (barely 6 mm. long); the teeth short, equal, broadly triangular: corolla 7-14 mm. long: capsule globose-ovate, obtuse.

Rich, damp, shady places. May to July. *Lyon; Trask; Brandegee (list)*: Creek Bed of Left Fork of Gallagher's Canyon, *Nuttall 843*. MUSK MONKEY FLOWER.

2. **M. guttatus** DC. Cat. Hort. Monsp. 127 (1813).

Erect or diffuse, from a fibrous annual root, and commonly perennial by short stolons, glabrous or merely puberulent: the ordinary erect form 3.3-12.2 dm. high: leaves ovate, oval or roundish, sometimes cordate, several-nerved from base and near it, sharply and irregularly dentate, or the lower occasionally lyrate-laciniate; the upper sessile; the floral becoming small and bract-like, often connate: peduncles becoming racemose, equalling or shorter than the flower: calyx becoming ovate-inflated in fruit and the upper tooth conspicuously largest: corolla from 6.3-19 mm. long, yellow, often dotted within and sometimes blotched with brown-red or purple.

Moist, shady places. May to June. *Lyon; Trask (as M. luteus); Brandegee (M. luteus and nastus)*. YELLOW MONKEY FLOWER.

3. **M. cardinalis** Dougl. Bth. Scroph. Ind. Introd. 28 (1835).

Mimulus cardinalis griseus Greene, Leaflets 2:2 (1909).

Villous with viscid hairs: leaves ovate and the upper often connate, the lower commonly obovate-lanceolate, all erosely dentate: corolla scarlet, 3-5 cm. long, with tube cylindrical hardly exceeding the calyx; the limb remarkably oblique, the upper lip nearly erect with the lobes turned back, the lower reflexed: stamens projecting.

In wet muck along shady canyon streams. March to June. *Lyon; Brandegee; Rock Springs Canyon, Trask, Carlson, Grant & Wheeler 787/6143, Smith 5100, Millsp. 4765, Nuttall 123, Knopf 136; Hamilton Canyon, Nuttall 698; Gallagher's Canyon, Eastwood 6475 (as M. cardinalis critens)*. CRIMSON MONKEY FLOWER, RED MONKEY FLOWER, ORANGE MONKEY FLOWER.

4. **M. Traskiæ** Grant. *sp. nov.*

Caules glanduloso-pubescentes, 10-14 cm. alti, simplices; foliis paucis, late ovatis, fere glabris, 30-40 mm. longis, 12-20 mm. latis, imis ad petiolum brevem angustatis, superioribus fere sessilibus; pedicellis angustis, 3-4 mm. longis; calyce anguste oblongo, 17-20 mm. longo, glanduloso-pubescenti, tubo membranaceo, guttere se extendente, dentibus longo-ovatis, superioribus incurvatis et quam aliis saltem bis longis; corolla rubro-purpurea et alba, 21-27 mm. longa.

tubo gracili quam dente summo calycis paulum longiore et sextuplo-octuplo longo quam gutture brevi infundibuliformique; labris inæqualibus, inferiore rubro-purpureo cum 3 lobis minimis rotundatis 2 mm. longis, superiore albo cum lobis latis erectis 10 mm. longis; stylo staminum jugum superius æquante, piloso; stigmatis labris inæqualibus, superioribus ovato-acutis, inferioribus triangularibus et non dimidio tantum longis; capsula 8 mm. longa, tardo dehiscente; seminibus non vidi.

Known only from the type locality near Avalon. In shade, Mar. 1901, *Blanche Trask* (Mo. Bot. Gard. Herb. No. 99805); U. S. Natl. Herb. and Herb. N. Y. Bot. Gard.

8. CASTILLEJA Mutis.

Herbs, sometimes partially parasitic on the roots of other plants, with alternate leaves; flowers in dense leafy-bracted spikes, the bracts often brightly colored and larger than the flowers. Calyx tubular, laterally compressed, cleft at the summit on the upper side, or also on the lower. Corolla very irregular, its tube not longer than the calyx, its limb 2-lipped; upper lip (*galea*) arched, elongated, laterally compressed, entire, enclosing the 4 didynamous stamens; lower lip short, 3-lobed. Anther-sacs unequal, the outer one attached to the filament by its middle, the inner one pendulous from its apex. Style filiform. Capsule loculicidally dehiscent, many-seeded. Seeds reticulated.

Corolla 20-40 mm. long. Sepals distinct laterally near apex. Leaves relatively long, and plant slightly to moderately soft-pubescent.

1. *Douglasii*.

Corolla 12-15 mm. long. Sepals united laterally to apex. Leaves only 1-2 cm. long, and plant densely woolly-pubescent.

2. *foliolosa*.

1. *C. Douglasii* Bth. DC. Prodr. 10:530 (1846).

Pubescent: stem strict and mostly simple, 3 dm.-1 m. high: flowers scattered or the upper crowded in the leafy spike, curving: calyx and the upper bracts tinged with red, bracts and calyx distally scarlet-red varying to salmon and yellow: corolla 20-40 mm. long, yellowish, or the tip reddish, surpassing the calyx; lower lip very short but protuberant, its callous oblong teeth rather shorter than the keels beneath them, the upper lip almost as long as the tube.

Grassy canyon sides. February to May. *Dall & Baker; Lyon; Trask; Brandegee* (as *parviflora*); Avalon Valley, *Smith* 4977, 5010, *Millsp.* 4516, 4650, *Nuttall* 1042, *Knopf* 11, 12; Pebble Beach Road, *Millsp.* 4927, *Knopf* 20; Pebble Beach Canyon, *Nuttall* 275; Rock Spring Canyon, *Millsp.* 4712; Schoolhouse Mountain, *Nuttall* 8; Gallagher's Canyon, *Millsp.* 4875; White's Valley, ridge trail to Black Jack, *Knopf* 76; Isthmus, *Millsp.* 4926 and Fisherman's Cove 4781; Middle Ranch Canyon, *Knopf* 371. PAINT CUP.

Perhaps this should be known as *C. affinis* Hook & Arn., 1833, a name concerning the application of which there is some uncertainty.

2. *C. foliolosa* H. & A. Bot. Beech. Voy. 154 (1833).

Woody, from 6.8-9.1 dm. high, white tomentose, stem shrubby, branching; leaves close together, the inferior linear-obtuse, the superior and floral divaricately-tripartite, rarely entire; flowers subsessile; calyx floriferous, tubular, the anterior and posterior divisions slightly lobed, emarginate; corolla shorter than the calyx tube. Bracts and calyx distally red.

Dry, sterile, open places. February to July. *Lyon; Trask; Brandegee; Avalon Valley, Macbride & Payson 859, Millsp. 4649, Nuttall 105; Pebble Beach Road, Smith 5056; Lookout Point, Nuttall 841. PAINT BRUSH.*

9. *ORTHOCARPUS* Nutt.

Herbs, mostly with alternate leaves, and yellow white or purplish flowers, in bracted spikes. Calyx tubular or tubular-campanulate, 4-cleft, or sometimes split down both sides. Corolla irregular, the tube slender, the limb 2-lipped; upper lip little if any longer than the 3-lobed 1-3-saccate lower one. Stamens 4, didynamous, ascending under the upper lip; anther-sacs dissimilar, the outer one affixed by its middle, the inner pendulous from its upper end, commonly smaller. Style filiform; stigma entire. Capsule oblong, loculicidally dehiscent, many-seeded. Seeds reticulated.

1. *O. purpurascens* Bth. Scroph. Ind. Intro. 13 (1835).

Annual, erect, rather stout, at length much branched from the base, 1.5-5 dm. high, villous-pubescent; leaves with lanceolate base or body, and laciniately 1-2-pinnately parted into narrow linear or filiform lobes, or the upper palmately cleft; spike thick and dense; bracts equaling the flowers, somewhat dilated, their lobes violet-purple, as are also the calyx and corolla; corolla 2.5-3 cm. long, the lip moderately saccate, white-tipped, with yellow and purple markings; galea densely purple-bearded on the back, incurved at tip; filaments hairy.

Grassy canyon sides and hillsides. March to May. *Trask; Brandegee; Avalon Valley east slope, Smith 5008; western slope of Mount Martha, Millsp. 4848; Schoolhouse Ridge, Nuttall 11; White's Landing, ridge trail to Echo Lake, Knopf 62, 63; very tall and profuse specimens from Cottonwood Canyon, Knopf 400. OWL CLOVER.*

Pure albino forms often found among the purple flowered plants.

Family 8. *BORAGINACEÆ*.*

BORAGE FAMILY

Herbs or shrubs. Leaves alternate, rarely opposite or verticillate, estipulate, mostly entire and hispid, pubescent, scabrous or setose.

*Specific determinations by J. Francis Macbride.

Flowers perfect, usually regular, in one-sided scorpioid spikes, racemes, cymes, or sometimes scattered. Calyx inferior, mostly 5-lobed, 5-cleft, or 5-parted, usually persistent. Corolla gamopetalous, mostly regular and 5-lobed, rarely irregular. Stamens as many as the corolla-lobes and alternate with them, inserted on the tube or throat; anthers 2-celled, the sacs longitudinally dehiscent. Disk commonly inconspicuous. Ovary superior, of 2, 2-ovuled carpels, entire, or the carpels commonly deeply 2-lobed, making it appear as of 4, 1-ovuled carpels; style simple, entire or 2-cleft; ovules anatropous or amphitropous. Fruit mostly of 4, 1-seeded nutlets, or 2, 2-seeded carpels. Endosperm fleshy, copious, or none; cotyledons mostly flat or plano-convex; radicle short.

Ovary not lobed, glabrous perennials.

Ovary 2-lobed.

Ovary 4-lobed, hispid or pubescent annuals:

Flowers white:

Nutlets divergent, wing-margined.

Nutlets erect:

Scar rounded.

Scar linear.

Flowers yellow.

1. HELIOTROPIUM.

2. HARPAGONELLA.

3. PECTOCARYA.

4. PLAGIOBOTHRYS.

5. CRYPTANTHA.

6. AMSINCKIA.

1. HELIOTROPIUM Linn.

Herbs or shrubs with alternate mostly entire leaves and small blue or white flowers in scorpioid spikes, or scattered. Calyx-lobes or segments lanceolate, ovate, or linear. Corolla salverform or funnellform, naked in the throat, its tube cylindric, its lobes imbricated, plicate or induplicate in the bud. Stamens included; filaments short, or none. Stigma conic or annular. Fruit 2-4-lobed, separating into 4, 1-seeded nutlets, or into 2, 2-seeded carpels.

1. *H. chenopodioides* Willd. Enum. Hort. Berol. 175 (1809).

Heliotropium oculatum Heller. Muhl. 1: 58 (1904).

A succulent and brittle herb with creeping rootstock; smooth, glaucous. Stems decumbent 2-6 dm. Flowering branches erect or inclined. Leaves 1 cm. broad, alternate, sessile, spatulate, smooth and glaucous, wavy margined. Inflorescence terminal, scorpioid branches 2 or 3, 0.5-1 dm. or more long. Flowers in 2 rows, alternate, purplish with a purple eye; calyx lobes 5, short, acuminate, enclosing the fruit; corolla about 4 mm. diameter, 5-lobed, short and openly campanulate, persistent. Stamens 5, attached low, subulate; stigma short, conic. Nutlets 1.5-2 mm. long, no scar, nervose, suture enlarged.

Saline mud or muck. June to September. *Lyon; Trask; Brandegec*; (all as *H. curassavicum* L.). Muddy shores of Catalina Harbor, *Pendleton 1430*; on bank of creek northwest beach of Little Harbor and silt near the sea shore at Howland's. *Nuttall 817, 807*. WILD HELIOTROPE. SEASIDE HELIOTROPE.

2. **HARPAGONELLA** Gray.

Calyx irregular; three of the sepals distinct nearly to the base, two united to near the middle. Corolla almost rotate, hardly surpassing the calyx; the throat with obtuse crests; the roundish lobes imbricated in the bud. Style short: stigma somewhat capitate. Divisions of the ovary globular, attached by the base to a nearly flat receptacle, two of them apparently always abortive. Ovule nearly erect, anatropous, the orifice inferior. Nutlets mostly 2, collateral, oblong, coriaceous, perfectly smooth, obliquely fixed by the base; one of them naked, ascending, and usually if not always infertile; the other larger and completely invested by the two united lobes of the now very oblique calyx, in the form of a bur (somewhat resembling that of a small *Franseria*), being sparsely beset with 7-9 long and diverging soft spines, which are armed with short hook-tipped bristles. Radicle inferior or centripetal. A little herb with the aspect of *Pectocarya*.

1. **H. Palmeri** Gray, Proc. Am. Acad. 11:88 (1875).

Diffuse and slender annual, 22 cm. high, minutely strigose-hirsute: leaves linear-lanceolate: flowers very small, lateral at all the nodes, on short at length deflexed peduncles: corolla white, minute: spines of the fruiting calyx as long as the bur-like body; the 3 free calyx-lobes small and rather remote.

Dry, exposed situations. April to May. *Grant & Wheeler* 540. The only collection to date. Not found elsewhere in California.

3. **PECTOCARYA** DC.

Calyx 5-parted, persistent, spreading. Corolla very small, salverform or funnelform, with crests in the throat. Stamens and very short style included. Nutlets widely spreading in pairs, horizontal, oblong or almost linear, surrounded by a more or less incurved wing-like border, which is sometimes deeply cut into stout bristle-bearing teeth, or is more or less beset with stiff bristles or slender prickles, the tips of which are simply hooked. Gynobase very short. Radicle of the embryo centripetal, i.e. pointing to the gynobase. Low and insignificant slender annuals, diffusely branching; with hoary strigose-hirsute pubescence, narrow linear leaves (barely 1 mm. wide), and very small lateral flowers scattered along the branches, on very short peduncles: corolla white.

Nutlets uncinat-bristled on wings.
Nutlets uncinat at tip only.

1. linearis.
2. pencillata.

1. **P. linearis** (R. & P.) DC. Prodr. 10:120 (1846).

Cynoglossum lineare Ruiz & Pavon, Fl. Peru 2:6 (1799).

Stems slender, diffusely branched from the base, decumbent or ascending, canescent throughout with appressed hairs, the leaves with spreading hairs; nutlets oblong, 4 mm. long, becoming recurved, the winged margins toothed, the teeth ending in an uncinate bristle, the apex thickly beset with slender uncinate bristles.

Dry, open hillsides and ridges. March to July. Trask "abundant"; *Brand-gee*; *Grant* 913; Pebble Beach Road, *Pendleton* 1400; along the Coach Road from Howland's to Cherry Valley, *Mills* 4820; Schoolhouse Mountain and at the lower end of the Equestrian Trail, *Nuttall* 28, 237.

2. **P. pencillata** (H. & A.) ADC. Prodr. 10:120 (1846).

Cynoglossum pencillatum H. & A. Bot. Beech. Voy. 371 (1841).

Plants very slender: nutlets little over 2.1 mm. long, with narrow and entire or rarely few-toothed wing, the apex thickly beset with hooked bristles, the sides more or less incurved and naked or sometimes bearing a few scattered bristles.

Dry, exposed situations. April to May. The only collection from the island that we have seen of this small and inconspicuous plant is that of *Geo. B. Grant*, in June, 1902.

4. **PLAGIOBOTHRYS** F. & M.

Low, commonly diffuse annuals, with small and short-pedicellate or subsessile flowers; the short corolla white: nutlets rugose or roughened, rarely smooth, ventrally carinate above the insertion, which is median or supra-basal, or rarely supra-median, only one or two commonly maturing, and then succumbent-horizontal upon the globular or depressed gynobase, tardily detached, leaving a kind of caruncle at the insertion (either projecting and solid or else annular and hollow), and corresponding depressed concavities on the gynobase.

Nutlets not stipitate:

Calyx cleft nearly to base.

Calyx cleft only to middle.

Nutlets stipitate.

1. *canescens*.

2. *arizonicus*.

3. *Cooperi*.

1. **P. canescens** Benth. Pl. Hartweg. 326 (1839).

Villous-pubescent and somewhat cinereous or canescent, especially the calyx, which when young may be fulvous or even somewhat rufescent: this 4.2-6.3 mm. long in fruit, loosely erect or sometimes more open and accrescent, persistent, rarely disposed to be circumscissile at base: nutlets with obtuser wrinkles.

Dry, exposed situations. April to June. The only collections of this plant on Catalina are those of *Geo. B. Grant* 997 and *Grant & Wheeler* 996/6159 for which no locality is stated on the labels.

2. *P. arizonicus* (Gray) Greene, Gray, Proc. Am. Acad. 22:284 (1886).
Eritrichium canescens arizonicum Gray, Proc. Am. Acad. 17:227 (1880).
Plagiobothrys arizonicus catalinensis Gray, Syn. Fl. Suppl. 431 (1886).
Plagiobothrys catalinensis Macbr., Proc. Am. Acad. 51:541 (1911).

Hirsute or even hispid with widely spreading hairs, not canescent: leaves mostly oblong-lanceolate: fructiferous calyx not over 4.2 mm. long, usually connivent over the acutely rugose and sparingly roughened nutlets, at length circumsessile at base.

Dry, open situations. March to May. *Lyon*; *Brandege*. On the Golf Links, *Nuttall* 1167; *Salta Verde*, *Knopf* 339. POPCORN FLOWER.

In the light of further material, the differences between this insular form and those of the mainland, prove so slight that the plants may well be considered simply races of the species.—Macbride.

3. *P. Cooperi* Gray, Proc. Am. Acad. 22:285 (1886).

Diffusely branched from the base, with sparsely-leaved ascending flowering stems 2-3 dm. long, more slender, hispidulous: leaves spatulate-linear to oblong-lanceolate: spikes at length sparsely flowered, sparingly bracteate or bractless above: corolla more conspicuous, with limb 4.2-6.3 mm. broad: nutlets more trigonous and reticulate-rugose, dentate-muriculate on the reticulations: caruncle more stalk-like and porrect.

Open, "dobe" soil. February to April. *Mrs. Trask* (as *Eritrichium* sp. and "Ham Spring No. 1"); on the Golf Links, *Mills* sp. 4720.

5. CRYPTANTHA Lehm.

(CRYPTANTHE.)

Annual caulescent herbs, with pubescent foliage. Leaves alternate: blades narrow, entire. Flowers in narrow scorpioid spikes or racemes. Calyx-lobes 5, erect, usually converging at maturity. Corolla white, funnelform, the tube usually closed by 5 scales in the throat; lobes 5, imbricated. Stamens 5, included: filaments short. Ovary of 4 nearly distinct carpels. Fruit of 4 nutlets with rounded backs and obtuse, acute, or winged margins, laterally attached to the receptacle.

Nutlets muriculate:

One nearly smooth and larger.

All alike.

Nutlets smooth and shining:

Nutlet 1, or rarely 2:

Groove divaricately forked at base.

Groove but slightly forked at base.

Nutlets 4.

1. micromeres.

2. intermedia.

3. microstachys.

4. ramosissima.

5. leiocarpa.

1. **C. micromeres** (Gray) Greene, Pittonia 1:113 (1887).

Krynitzkia micromeres Gray, Proc. Am. Acad. 20:274 (1884).

Slender and diffusely branched, less than 3.3 dm. high: leaves 6.3-12.7 mm. long: spikes filiform, simple or occasionally in pairs: flowers minute: fructiferous calyx 1-2 mm. long: nutlets ovate-trigonus, acutish, rather shining, but muriculate-scabrous on the back, lateral angles acute, and inner faces commonly concave; ventral groove abruptly dilated below.

Open situations on dry hillsides. March to May. "Ham Spring No. 2," *Trask*; on freshly turned soil half way up the Equestrian Trail, *Nuttall* 156.

2. **C. intermedia** (Gray) Greene, loc. cit. 114:

Krynitzkia intermedia Gray, loc. cit. 273.

Resembling the last in habit; calyx-lobes 3-5 mm. long, armed with rather rigid and pungent, whitish or rusty-yellowish bristles; corolla usually less than 4 mm. broad; nutlets grayish, about 2 mm. long, oblong-ovate, thickly rough-muricate; scar wholly or partly open, with an open areola.

Dry, open situations. March to May. *Lyon*; *Brandegee* (as *Krynitzkia ambigua*); *Grant* 242; Avalon Canyon, *Smith* 4982; bank of the Coach Road between Cherry Valley and Howland's, *Millsp.* 4809; Coach Road upper Descanso Canyon, *Nuttall* 48; Moonstone Beach, *Knopf* 381.

3. **C. microstachys** Greene loc. cit. 116.

Krynitzkia microstachys Greene, Gray, loc. cit. 269.

Rarely over 3 dm. high, spreading, hispidulous or hispid: fructiferous calyx ascending or erect but hardly appressed to the rhachis, from barely 2.1 mm. to nearly 4.2 mm. in length, with mostly attenuate and rigid sepals, hispid with widely spreading (but not deflexed) and somewhat pungent bristles: nutlet flattened ventrally, the groove of attachment divaricately forked and somewhat open at base.

Dry, open situations. February to July. *Brandegee*; Pebble Beach Road, *Pendleton* 1403, *Millsp.* 4744, *Knopf* 24, 143; Descanso Canyon, *Millsp.* 4666 and Fisherman's Cove 4783.

4. **C. ramosissima** Greene, loc. cit. 116.

Krynitzkia ramosissima Greene, Bull. Calif. Acad. 1:203 (1885).

Annual, stoutish, rigid and densely paniculate-branching, up to 3.3 dm. high: leaves linear-oblong, mostly 12.7 mm. long, apparently fleshy, and the smallest subterete, beset with a few coarse, hispid hairs: spikes leafy-bracted: calyx setose-hispid and more or less white-villous; nutlet solitary, ovate-acuminate, brown, smooth and shining, ventral face flat, the groove closed and without any bifurcation, or opening at base.

Dry, exposed situations near the sea. March to May. *Lyon*; *Mrs. Trask* (as *C. Torreyana*); *Brandegee*.

Monographic treatment of this genus will, doubtless, place this insular form (and possibly *C. cedrosensis* Greene) under *C. maritima* Greene. The specific standing of *C. ramosissima* is questionable.

5. **C. leiocarpa** (F. & M.) Greene, *loc. cit.* 117.*Krynitzkia leiocarpa* Fisch & Mey. Sem. Hort. Petrop. 52 (1841).

Commonly branched from the base, 1-3 dm. high, appressed-pubescent and pilose-hispid; spikes leafy bracted, the terminal larger and interrupted, the lateral short and glomerate; sepals short-linear, hispid bristly; nutlets 4, smooth, narrowly ovate, acute, 1.5 mm. long, the ventral groove not forked or scarcely so.

Dry, exposed sandy situations near the coast. May to July. Our only specimen, somewhat doubtfully placed to this species, is *Hasse 4156*. It has 4 smooth nutlets with rounded angles and a closed groove that opens at the base—Macbride.

6. **AMSINCKIA** Lehm.

Rough-hispid annuals with oblong or linear leaves, and scorpioid-spicate flowers, sometimes the lowest and rarely all leafy-bracteate; the corolla yellow, slender, with open throat, either wholly naked or with minute bearded crests. Stout bristles of the herbage commonly with pustulate-dilated base. Calyx-lobes in several species disposed to be occasionally united 2 or 3 together almost to the top. Flowers in most species all heterogone-dimorphous, at least in the insertion of the stamens; when these are high the throat of the corolla is quite naked.

Flowers large, well exerted from the calyx.

1. *Douglasiana*.

Flowers small, barely exerted from the calyx.

2. *parviflora*.1. **A. Douglasiana** A. DC., DC. Prodr. 10:118 (1846).

Stem erect, simple, glabrous below, softly setose-pubescent at the apex; leaves linear-lanceolate, acute, sometimes broadened at the base, appressed-hispidulose when young, setose and bulbous at the base on the older leaves; racemes becoming elongated; calyx-lobes linear, obtuse, very hispid; corolla smooth, twice the length of the calyx; stamens included in the upper part of the corolla; plants 3.3 dm. or more; cauline leaves 4-8 cm. long by 3.8 mm. wide or even more. Corolla deep orange-yellow, about 8 mm. long; racemes simple or sometimes branched, much elongated as the fruits develop; nutlets pyriform, angular, pointed, honey-comb-reticulate, granular.

Open fields and grassy or shady hillsides general. March to May. *Trask; Brandegee; Smith 4973; Millsp. 4616, 4700, 4725, 4754, 4796, 4890; Nuttall 46, 61; Knopf 1*. A prevalent species quite distinct in the field but passing through a wide range of races variant in size of plant and breadth of leaf. The species is variously reported from Catalina as *A. tessellata*, *A. intermedia*, *A. spectabilis* and *A. lycopsoides*.

2. **A. parviflora** Heller, Muhl. 2:313 (1907).

Stems 3-5 dm. high, rather strict, hispid with straight bristle-like hairs as well as somewhat strigose, leafy, but the leaves rather remote, linear-oblong, 5-10 mm. wide, the largest 5 or 6 cm. long, the shortly

apiculate apex acute, or merely acutish in the larger ones, hispid, especially above, with appressed bristle-like hairs from a pustulate base, midvein prominent beneath: spikes dense above, loosely flowered below, 1 dm. long or less, but probably much elongated when in full fruit: flowering calyx 4 mm. long, 6 or 7 mm. in fruit, strigose and hispid like the stem, especially the tube, less so on the linear lobes, these 1 mm. wide: corollas pale yellow, small, barely exerted from the calyx, 5 mm. long, the tube cylindrical, between 3 and 4 mm. long, the lobes somewhat ovate, 1 mm. wide and only a little longer, rounded at apex: stamens equaling the corolla tube: pistil the length of the stamens, the stigma somewhat 3-lobed: nutlets 2 mm. long, ovoid, curved and the back sharply keeled, this dotted with points, as are also the irregular transverse ridges, the intervening spaces with shorter points.

Waste ground in Avalon, February 14, 1920. *Millsp.* 4715. A clump of several plants in this the only known locality on the island where it is doubtless introduced from the mainland.

Family 9. VERBENACEÆ.

VERBENA FAMILY

Herbs, shrubs or some tropical genera trees, with opposite verticillate or rarely alternate leaves, and perfect irregular or sometimes regular flowers, in spikes, racemes, cymes or panicles. Calyx inferior, mostly persistent, usually 4-5-lobed or 4-5-cleft. Corolla regular, or 2-lipped, the tube usually cylindric and the limb 4-5-cleft. Stamens 4, didynamous, rarely only 2, or as many as the corolla-lobes, inserted on the corolla and alternate with its lobes; anthers 2-celled, the sacs longitudinally dehiscent. Ovary superior, 2-4-celled (rarely 8-10-celled), composed of 2 carpels, each carpel with 2 anatropous or amphitropous ovules, thus in 4-celled ovaries 1 ovule in each cavity; style terminal; stigmas 1 to 2. Fruit dry, separating at maturity into 2-4-nutlets, or a drupe containing the 2-4-nutlets. Endosperm little or none, or rarely fleshy; embryo straight.

Corolla 5-lobed, nutlets 4.
Corolla 4-lobed, nutlets 2.

1. VERBENA.
2. LIPPIA.

1. VERBENA Linn.

Herbs with the flowers in single or paniced spikes or heads, small, or in some showy. The commoner species are apt to hybridize naturally, and the hybrids are not rarely fertile. Calyx tubular or plicately prismatic, 5-toothed, one tooth often shorter. Corolla salverform: the tube sometimes curved; the limb more or less unequally 5-cleft. Stamens 4, included: the upper pair sometimes sterile. Stigma of two

dissimilar lobes, one of them smaller and mostly abortive. Ovary 4-celled, in fruit splitting into 4 one-seeded little nutlets.

1. **V. prostrata** R. Br. Ait. Hort. Kew. ed. 2, 4:41 (1812).

Soft-hirsute or villous: stems at first erect or ascending, 3-12 dm. high, at length widely branched and diffuse, rarely prostrate: leaves obovate, ovate, or oblong, with cuneate base tapering into a margined petiole, sharply serrate, incised, or 3-5-cleft: spikes solitary or paniced, rather slender but dense when in flower, becoming 10-27 cm. long, hirsute or villous: bracts subulate, not longer than the calyx: corolla violet or blue, 4.2 mm. long.

In canyons and arroyas. June to August. *Lyon*; *Trask*; *Macbride & Payson* 850; vicinity of Avalon and along Pebble Beach Road, *Smith* 4994, 5063; White's Landing, *Mills* 4588; Rock Spring Canyon and at Chicken Johnny's *Nuttall* 125, 348; Graveyard Canyon, Pebble Beach and Pebble Beach Canyon, *Knopf* 130, 160, 246. **VERVAIN.**

The specimens show many vegetative races from a single to a twenty branched inflorescence and a height from 1-7 feet. The specific name is unfortunate as the plants are strictly erect.

2. **LIPPIA** Linn.

Perennial herbs, or shrubs, with opposite, or rarely alternate leaves, and small bracted flowers, in spikes or heads. Calyx small, ovoid, campanulate or compressed and 2-winged, 2-4-toothed or 2-4-cleft. Corolla-tube cylindric, the limb oblique, somewhat 2-lipped, 4-cleft. Stamens 4, didynamous; anthers ovate, not appendaged, the sacs nearly parallel. Ovary 2-celled; ovules 1 in each cavity; style short; stigma oblique or recurved. Fruit dry, with a membranous exocarp, at length separating into 4 nutlets.

1. **L. nodiflora** (L.) Michx. Fl. Bor. Am. 2:15 (1803).

Verbena nodiflora Linn. Sp. Pl. 20 (1753).

Minutely and rather densely puberulent, herbaceous, creeping, or the branches ascending, 3-9 dm. long. Leaves thickish, spatulate, oblanceolate, or obovate, 1-6 cm. long, 0.6-2.5 cm. wide, inconspicuously veined, mostly obtuse, narrowed into a cuneate entire base, sharply serrate above the middle; heads at length cylindric and 1-2.5 cm. long; corolla purple to white, little longer than the bracts.

In moist or silt soil, exposed situations. May to July. Ditch of Pebble Beach Road, *Smith* 5044; in a rock cleft near the Sugar Loaf, *Nuttall* 601. **CAPEWEED.**

Family 10. **LAMIACEÆ.**

MINT FAMILY

Aromatic punctate herbs, or shrubs (a few tropical species trees),

mostly with 4-sided stems and simple opposite leaves; stipules none. Flowers irregular, perfect, clustered, the inflorescence typically cymose, usually bracteolate. Calyx inferior, persistent, 5-toothed or 5-lobed (rarely 4-toothed), mostly nerved. Corolla with a short or long tube, the limb 4-5-lobed, mostly 2-lipped, regular in a few genera; upper lip 2-lobed, or sometimes entire; lower lip mostly 3-lobed. Stamens borne on the corolla-tube, typically 4 and didynamous, sometimes 2, rarely equal; filaments separate, alternate with the corolla-lobes; anthers 2-celled, introrse, or confluent 1-celled, or sometimes of a single sac. Disk usually present, fleshy. Ovary 4-lobed, or 4-parted, superior, each lobe or division with 1 mostly anatropous ovule; style arising from the centre of the lobed or parted ovary, 2-lobed at the summit. Fruit of 4, 1-seeded nutlets. Seed erect (transverse in *Scutellaria*); endosperm scanty, or none; embryo mostly straight; radicle short, inferior.

Flowers solitary, axillary:

Trailing herbs, flowers small.

Shrubby, flowers large.

Flowers clustered in whorls or spikes:

Calyx regular or the teeth nearly equal:

Corolla nearly regular.

Corolla strongly bilabiate:

Anther sacs parallel.

Anther sacs divergent:

Anther-bearing stamens 4.

Anther-bearing stamens 2:

Connective transverse.

Connective continuous with the filament.

1. MICROMERIA.

2. SPIACEAE.

3. MENTHA.

4. MARRUBIUM.

5. NEPETA.

6. SALVIA.

7. RAMONA.

1. MICROMERIA Benth.

Shrubs or perennial herbs, with entire or dentate leaves and small axillary clustered or solitary flowers. Calyx tubular, its tube mostly 13-ribbed, its 5 lobes nearly equal. Corolla 2-lipped; upper lip erect, often very small; lower lip 3-lobed, the middle lobe commonly emarginate. Stamens 4, converging under the upper corolla-lip; anthers 2-celled, the sacs divergent. Ovary 4-carpellary; style basal. Nutlets smooth, basally attached.

1. **M. chamissonis** (Benth.) Greene, Man. Bay Reg. 289 (1894).

Thymus chamissonis Bth. in Linnæa 6:80 (1831).

Micromeria Douglasii Bth. Lab. 372 (1833).

Perennial herb, slightly pubescent, with long and slender creeping and trailing stems: leaves round-ovate, thin, sparingly toothed (2.6 cm. or less in diameter) short-petioled: flowers mostly solitary in the axils, on a long and filiform 2-bracteolate peduncle: calyx-teeth

subulate: corolla purplish, 8.4 mm. long, twice the length of the calyx, the tube exserted.

Moist, sandy soil in shady places. March to September. *Lyon; Trask; Brandegee; McClatchie*; Coach Road near Summit, *Smith 5100*; Middle Ranch Canyon, *Nuttall 295, 892; Knopf 357*. YERBA SANTA, YERBA BUENA.

A tea made of the plant proves to be sedative especially for children. It also makes a pleasant and fragrant tea.

2. SPHACELE Benth.

Somewhat shrubby, veiny-leaved, and rather large-flowered. Calyx campanulate, nearly equally 5-cleft, thin-membranaceous and reticulated, especially when enlarged in fruit, irregularly about 10-nerved, naked within. Corolla cylindraceous or oblong-campanulate, with 5 broad and roundish rather erect lobes, the lower one longest: a hairy ring at the base of the tube within. Stamens 4, distant, somewhat ascending: filaments naked; the posterior pair shorter: anther-cells diverging.

1. *S. fragrans* Greene, Pitton. 1:38 (1887).

S. caylcina Wallacci Gray, Syn. Fl. 2, 1:365 (1878).

Shrub 18.3 dm. high: leaves ovate-oblong, obtuse, coarsely and irregularly dentate, hastate at base, 5.1-10.1 cm. long, of thin texture, loosely white-woolly beneath, glabrate above, not resinous, agreeably aromatic: calyx open-campanulate, more than 2.6 cm. long, its lobes triangular-lanceolate, as long as the tube: nutlets large, glabrous: corolla not seen.

Dry, exposed places. June to September. *Wallace; Trask* ("Rare. Found in volcanic region"); side of a wash in Middle Ranch Canyon, *McClatchie*; dry creek bed among pebbles in silt above the buildings at Middle Ranch, *Nuttall 891*. PITCHER SAGE.

3. MENTHA Linn.

Erect or diffuse odorous herbs, with simple sessile or petioled mostly punctate leaves, and small whorled purple pink or white flowers, the whorls axillary or in terminal dense or interrupted spikes. Calyx campanulate to tubular, 10-nerved, regular, or slightly 2-lipped, 5-toothed. Corolla-tube shorter than the calyx, the limb 4-cleft, somewhat irregular, the posterior lobe usually somewhat broader than the others, entire or emarginate. Stamens 4, equal, erect, included or exserted, sometimes imperfect; filaments glabrous; anthers 2-celled, the sacs parallel. Ovary 4-parted; style 2-cleft at the summit. Nutlets ovoid, smooth.

1. **M. piperita** L. Sp. Pl. 576 (1753).

Perennial by subterranean suckers; stems glabrous, mostly erect, branched, 3.3-9.1 dm. high. Leaves lanceolate, petioled, dark green, acute at the apex, rounded or narrowed at the base, rather firm, sharply serrate, glabrous on both sides, or pubescent on the veins beneath and resin-dotted, the larger 3.8-7.6 cm. long, 2.6-3.8 cm. wide; whorls of flowers in terminal dense or interrupted spikes, which are thick and obtuse, and become 2.6-7.6 cm. long in fruit, the middle one at length overtopped by the lateral ones; bracts lanceolate, acuminate, not longer than the flowers, or the lower occasionally foliaceous; calyx tubular-campanulate, glabrous below, its teeth subulate, ciliate, one-half as long as the tube or more; corolla glabrous; style occasionally 3-cleft.

In wet, compact, silt and loam around the spring at Empire Landing near the quarry, Oct. 31, 1921, *Knopf* 247. First return of this species from the island. PEPPERMINT.

4. **MARRUBIUM** Linn.

Bitter-aromatic whitish-woolly perennials, branched from the base; leaves rugose; flowers small, much crowded in axillary false whorls or heads. Calyx cylindraceous, 5-10 nerved, of firm texture, 10-toothed: the alternate (accessory) teeth shorter, spiny-tipped and recurved at maturity. Corolla short, its tube included in the calyx; the upper lip erect and concave, narrow, 2-lobed at the tip; the lower spreading and 3-cleft. Stamens 4, included in the tube of the corolla; anthers 2-celled, but the cells confluent.

1. **M. vulgare** Linn. Sp. Pl. 583 (1753).

Shrubby, 3.3-6.8 dm. high, hoary-woolly: leaves roundish crenate: flowers crowded in the upper axils; corolla small, white; calyx-teeth and bracts hooked at the tip.

Prevalent on dry hillsides. January to August. Of this European migrant, now common almost everywhere on the island, *Mrs. Trask* says: "A single specimen was collected at Avalon, by *Dr. Bishop* in 1896;" she also collected it the same year. Avalon Valley, *Smith* 5076, *Fisher*; Pebble Beach Road, *Nuttall* 71, *Knopf* 159; Rock Spring Creek, *Nuttall* 717; Middle Ranch, *Millsp.* 4605. HOREHOUND.

5. **NEPETA** Linn.

Herbs, with dentate or incised leaves, and mostly white or blue rather small flowers in verticillate clusters, usually crowded in terminal spikes, or axillary and cymose. Calyx tubular, somewhat oblique at the mouth, 15-nerved, usually incurved, 5-toothed, scarcely 2-lipped, but the upper teeth usually longer than the lower. Corolla-tube enlarged above, the limb strongly 2-lipped; upper lip erect, emarginate

or 2-lobed; lower lip spreading, 3-lobed, the middle lobe larger than the lateral ones. Stamens 4, all anther bearing, didynamous, ascending under the upper lip, the lower pair the shorter; anthers 2-celled, the sacs divaricate. Ovary deeply 4-parted: style 2-cleft at the summit. Nutlets ovoid, compressed, smooth.

1. **N. Cataria** Linn. Sp. Pl. 570 (1753).

Perennial, densely canescent, pale green: stem rather stout, erect, branched, 5.1-7.6 cm. high, the branches straight, ascending. Leaves ovate to oblong, petioled, acute at the apex, coarsely crenate-dentate, mostly cordate at the base, 2.6-7.6 cm. long, greener above than beneath; flower-clusters spiked at the ends of the stem and branches, the spikes 2.6-12.7 cm. long; bracts small, foliaceous; bractlets subulate; calyx puberulent, its teeth subulate, the upper about one-half the length of the tube; corolla nearly white, or pale purple, dark-dotted, puberulent without, 10.5-12.7 mm. long, its lobe a little longer than the calyx, the broad middle lobe of its lower lip crenulate.

Waste places rare. July to September. This common Eastern species is rare on the Pacific Coast. Greene reports it from Marin, Sonoma and Solano counties and Parish from Edgar Canyon San Bernardino Mountains. It was first found on Catalina in 1919 by *Pendleton* (1391) in Chicken Johnny's yard (see p. 10), where it persists (*Mills* p. 4894, *Nuttall* 831). CATNIP.

6. **SALVIA** Linn.

Herbs, or some species shrubs, with clustered flowers, the clusters mostly spiked, racemed, or paniced. Calyx mostly naked in the throat, 2-lipped; upper lip entire or 3-toothed; lower lip 2-cleft or 2-toothed. Corolla strongly 2-lipped; upper lip entire, emarginate or 2-lobed; lower lip spreading, 3-cleft or 3-lobed. Anther-bearing stamens 2 (the posterior pair wanting or rudimentary); connective of the anthers transverse, linear or filiform, bearing a perfect anther-sac on its upper end, its lower end dilated, capitate, or sometimes bearing a small or rudimentary one. Nutlets smooth, usually developing mucilage and spiral tubes when wetted.

1. **S. Columbariæ** Benth. Lab. 302 (1833).

Minutely tomentose or soft-pubescent; stem commonly slender, branching, and leafy below, up to 6.8 dm. high from an annual root, naked and peduncle-like below, terminated by a solitary or two proliferous head-like false whorls: leaves deeply once or twice pinnatifid or parted into oblong and crenately-toothed or incised divisions, pointless, rugose: involucrate floral leaves bract-like and short, ovate, entire: bracts similar but membranaceous, sometimes purplish, abruptly acuminate-awned: flowers small: calyx naked within its large upper lip

arched, hispid at base outside, tipped with a pair of connivent and partly connate short-awned teeth, much exceeding the two small and prorected teeth of the lower lip; corolla (blue) hardly exceeding the calyx; its upper lip merely notched; the lower with small lateral lobes: the middle one much larger, transversely oval, on a short claw, 2-lobed, and otherwise nearly entire: filaments slender.

Rather common (Mrs. Trask says) on dry, rocky hillsides. April to June. *Trask*; *Brandegee*; Schoolhouse Ridge, *Nuttall* 38. Trail from Moonstone Beach to White's Landing, *Knopf* 374. CHIA, SAGE.

The seeds formed one of the most important "grains" of the Aborigines who ground them into meal for porridge and cakes. They were also used in lieu of linseed for dysentery and enteritis.*

7. RAMONA Greene.

Shrubs or undershrubs, with habit, foliage, inflorescence, and even the peculiar spathe-like oblique calyx of the Californian *Salvias*; but the corolla with no proper upper lip; its throat inflated and horizontally split, the upper portion of this either obsolete, or vertically cleft and the segments divergent, exposing fully the stamens from their insertion on the bottom of the throat. Genitals all long-exserted. Stamens 2, consisting of a distinct filament articulated with the single arm of the connective present, this on the same plane with the proper filament, bearing the one anther-cell at its summit.

Flowers in dense, verticillate glomerules.
Flowers in thyrsoid-panicles.

1. stachyoides.
2. polystachya.

1. *R. stachyoides* (Benth.) Briquet, Bull. Herb. Boiss. 2:440 (1894).

Audibertia stachyoides Bth. Lab. Gen. & Sp. 313 (1833).

Salvia mellifera Greene, Pitton. 2:236 (1892).

Cinereous-tomentose or glabrate, shrubby, 1 m. high or more, branching and leafy, leaves oblong-lanceolate, narrowed at base or short-petioled, crenate, green and rugose above, cinereous-tomentose beneath; flowers in interrupted spicate heads or whorls; the floral leaves much reduced, these and the ovate or oblong bracts as well as the calyx-teeth of the bilabiate calyx cuspidate-acuminate or spinulose-aristulate; corolla white or lilac-tinged, about 1 cm. long, the tube longer than the limb; style, and especially the stamens, little exserted; subulate appendages of the connective often manifest.

Common on dry, exposed hillsides. April to July. *Lyon* (*R. Clevelandi* of Abrams); *Trask*; *McClatchie* (as *A. Palmeri*); *Smith* 5032; *Pendleton* 1370; *Eastwood* 6457; *Brandegee*; *Millsp.* 4560, 4777; *Nuttall* 73; *Knopf* 89; Pacific slope of the Salta Verde, *Knopf* 344.

A very variable species as to shape of leaves, size of parts, blueness of flowers and general aspect. BLACK SAGE. PURPLE SAGE.

*See also Dr. Edwd. Palmer's article on the chias in *Zoe* Vol. 1, p. 140.

2. *R. polystachya* (Benth.) Greene, Pitton. 2:235 (1892).
Audibertia polystachya Bth. Lab. Gen. & Sp. 314 (1833).
Salvia apiana Jeps. Muhl. 3:144 (1908).

Shrubby below, 1 mm. high or more, minutely tomentose-canescenscent, the branches virgate; leaves mostly very white on both surfaces, oblong-lanceolate, minutely rugose and crenulate, 5-8 cm. long; inflorescence thrysoid-paniculate, 3-6 dm. long; the floral leaves, bracts and bractlets small and loose, at length reflexed, lanceolate or subulate, cuspidate-tipped; flowers sessile, loose; upper lip of calyx truncate or 3-toothed, at length concave or galeate, longer than the triangular-subulate lower lip; corolla white or nearly so, the lower lip much enlarged, the middle lobe rounded, emarginate at apex, unguiculate, the upper lip short; tube very short; style and divergent stamens long-exserted; filiform connective continuous with the filament, its lower end usually indicated by a minute tooth.

A common shrub of exposed hillsides. May to November. *Lyon; Trask; Brandegee; Smith 5075; Pendleton 1396* (as *Salvia californica*); *Millsp. 4460; Nuttall 599, 152, 744; Knopf 131*. WHITE SAGE, CANDLEWOOD, OCO-TILLO.

[*Monardella lanceolata* Gray. Reported by Lyon, and so included in Brandegee's List, is not corroborated by a specimen in the Lyon collection in herb. Gray. It has not since been returned from the island.]

FAMILY II. OROBANCHACEÆ.

BROOM RAPE FAMILY

Erect, simple or branched, brown yellowish purplish or nearly white root-parasites, the leaves reduced to alternate appressed scales, the flowers perfect, irregular (rarely cleistogamous), sessile in terminal bracted spikes, or solitary and peduncled in the axis of the scales. Calyx inferior, gamosepalous, 4-5-toothed, 4-5-cleft, or split nearly or quite to the base on one or both sides. Corolla gamopetalous, more or less oblique, the tube cylindric, or expanded above, the limb 2-lipped, 5-lobed. Stamens 4, didynamous, inserted on the tube of the corolla and alternate with its lobes, a fifth rudimentary one occasionally present; filaments slender; anthers 2-celled, the sacs parallel, equal. Ovary superior, 1-celled, the four placentæ parietal; ovules numerous, anatropous; style slender; stigma discoid, 2-lobed, or sometimes 4-lobed. Capsule 1-celled, 2-valved. Seeds numerous, reticulated, wrinkled or striate; embryo minute; cotyledons scarcely differentiated.

Calyx not 2-bracteate.
 Calyx 2-bracteate.

1. THALESIA.
 2. MYZORRHIZA.

1. THALESIA Raf.

Glandular or viscid-pubescent simple-stemmed herbs, parasitic on

the roots of various plants, with scattered scales, and long-peduncled yellowish white or violet, complete and perfect flowers without bractlets. Calyx campanulate or hemispheric, nearly equally 5-cleft, the lobes acute or acuminate. Corolla oblique, the tube elongated curved, the limb slightly 2-lipped, the upper lip erect-spreading, 2-lobed, the lower spreading, 3-lobed, the lobes all nearly equal. Stamens included; anther-sacs mucronate at the base. Ovary ovoid; placentæ equidistant, or contiguous in pairs; style slender, deciduous; stigma peltate, or transversely 2-lamellate.

1. **T. fasciculata** (Nutt.) Britton, Mem. Torr. Club 5:298 (1894).
Orobanche fasciculata Nutt. Gen. 2:59 (1818).
Aphyllon fasciculatum Gray, Syn. Fl. 2, 1:312 (1878).

Stems erect, 5.1-10.1 cm. high, densely glandular-pubescent, bearing several scales and 3-15 naked 1-flowered peduncles 2.6-10.1 cm. long. Calyx glandular, broadly campanulate, 6.3-10.5 mm. high, about one-third the length of the corolla, its lobes triangular-lanceolate or triangular-ovate, acute, equalling or shorter than the tube; corolla nearly 2.6 cm. long, purplish to yellow, puberulent without, the curved tube 3 times as long as the limb, the lobes oblong, obtuse, capsule ovoid to globose.

Dry, exposed banks parasitic on roots of *Eriogonum* and *Artemisia*. June to July. Banks of Pebble Beach Road, *Pendleton 1353, Reed 2826, Nuttall 555*; top of Mount Wilson, *Nuttall 355*; trail Moonstone Beach to White's, *Knopf 375*. BROOM RAPE.

2. MYZORRHIZA Philippi.

Stems rising above the ground. Flowers yellow or purplish, racemose or paniced or spicate, mostly with one or two bracts close to or rarely somewhat below the calyx. Corolla plainly bilabiate, upper lip 2 lobed or notched, lower-lip 3-parted.

1. **M. tuberosa** (Gray) Rybd. Bull. Torr. Club 36:695 (1909).
Aphyllon tuberosum Gray, Bot. Calif. 1:585 (1876).

Minutely puberulent, low and stout, 5-15 cm. high, the thickened base with firm imbricated scales: flowers in a compact cluster; calyx unequally cleft, a little shorter than the yellowish or purplish corolla.

On *Adenostoma* roots. May to June. *Mrs. Trask* (in herb. N. Y.); *Brandegee list*. We have not found the species which cannot be very common on the island.

Order 23. PLANTAGINALES.

Characters of the only family in the order—as follows:

Family I. **PLANTAGINACEÆ.**

PLANTAIN FAMILY

Herbs, with basal, or, in the caulescent species, opposite or alternate leaves, and small perfect polygamous or monoecious flowers bracteolate in spikes or heads, or rarely solitary. Calyx 4-parted, inferior, persistent, the segments imbricated. Corolla hypogynous, scarious or membranous, mostly marcescent, 4-lobed. Stamens 4 or 2 (only 1 in an Andean genus), inserted on the tube or throat of the corolla; filaments filiform exserted or included; anthers versatile, 2-celled, the sacs longitudinally dehiscent. Ovary sessile, superior, 1-2-celled, or falsely 3-4-celled. Style filiform, simple, mostly longitudinally stigmatic. Ovules 1-several in each cavity of the ovary, peltate, amphitropous. Fruit a pixis, circumscissile at or below the middle, or an indehiscent nutlet. Seeds 1-several in each cavity of the fruit; endosperm fleshy; cotyledons narrow; radicle short, mostly straight.

I. **PLANTAGO** Linn.

Leafy-stemmed, short-stemmed or acaulescent herbs, with opposite, alternate or basal leaves, bearing axillary or terminal spikes or heads of small greenish or purplish flowers (flowers solitary in a few exotic species). Calyx-segments equal, or two of them larger. Corolla salverform the tube cylindric, or constricted at the throat, the limb spreading in anthesis, erect, spreading or reflexed in fruit, 4-lobed or 4-parted. Stamens 4 or 2. Ovary 2-celled, or falsely 3-4-celled; ovules 1-several in each cavity. Fruit a membranous pyxis, mostly 2-celled. Seeds various, sometimes hollowed out on the inner side.

Inflorescence globose:

Leaves narrowly linear entire:

Glabrous or nearly so.

Cottony especially below.

1. *Bigelovii*.

2. *erecta*.

Leaves broadly linear dentate:

Cottony below.

3. *insularis*.

Inflorescence cylindric:

Plants low, spikes short:

Densely floral.

Openly flowered.

4. *dura*.

5. *Parishii*.

Plants tall, spikes elongate:

Inflorescence slender, tail-like leaves incised-dentate.

6. *coronopus*.

Inflorescence thick-cylindrical, leaves entire.

7. *speciosa*.

1. **P. Bigelovii** Gray, Pac. RR. Rept. 4:117 (1856).

Annual, small and slender, 9 cm. or less in height, slightly hirsute: leaves linear, obtuse, entire, 2.1-4.2 mm. wide, the broader ones ob-

scurely 3-nerved, shorter than the scape: spike globose, about 4 mm.-1 cm. often shorter and reduced to 4-5 flowers, densely few-many-flowered: bracts carinate, about the length of the calyx; calyx-lobes broadly scarious-margined: lobes of the corolla ovate, remaining open: stamens and style a little exserted: capsule ovoid-oblong, somewhat exceeding the calyx, circumscissile at the lower third, 2-celled, 4-seeded: seeds oblong, not hollowed on the face.

Dry flat places. April to May. Ridge back of the Catholic Church at Avalon, *Mills* 4479, 4910; Schoolhouse Ridge, *Nuttall* 1215; Pebble Beach flat, *Mills* 4745 and flat near Howland's 4821.

2. *P. erecta* Morris, Bull. Torr. Club. 27: 118 (1900).

A low bright or dark green acaulescent annual, generally pubescent or sparingly villous: leaves basal, strict and erect or rarely spreading, rather slender, several to numerous, narrowly linear, obtuse at the apex, almost truncately and brown callous-tipped, entire, usually involute towards the apex, narrowed to the long slightly clasping petiole, 40-100 mm. by 1-2.5 mm., 3-ribbed, the outer very near the margins and frequently forming a part of the involution, pubescent with spreading hairs: scapes strictly erect or rarely spreading, slender at the base, gradually dilated and tending to become stout at the base of the spikes, one to several, surpassing the leaves, 50-200 mm. high, occasionally higher, appressed pubescent: spikes thick, four- to twenty-flowered, sometimes many-flowered, erect, oval-capitate to oblong-cylindrical, 10-20 mm. by 6-8 mm., glabrous or pubescent: bracts small, rigid, thick, herbaceous, scarious-sided, about one-half as long as the sepals, ovate, obtuse or acute, with a few spreading hairs to sparingly villous; flowers perfect: calyx with spreading hairs, its divisions thick, herbaceous, scarious-sided, green to brownish, oblong, obtuse, 3 mm. long: corolla with the tube just surpassing the calyx, its lobes strongly reflexed, two or three times as long as the constricted dark brown throat, orbicular, obtuse or abruptly apiculate, 2.25 mm. by 2 mm., white: stamens shorter than the petals or very long-exserted from the tube: pyxis one-third surpassing the calyx, ovate, truncate or retuse, 4-5 mm. by 2 mm., circumscissile at the lower third, purple: seeds two, dark brown, oblong, finely pitted.

On dry open ridges. May to June. *Brandege* list; Lyon (as *P. patagonica*); dry hillside near Pebble Beach, *Parish* 10750; Equestrian Trail and Middle Ranch Canyon, *Nuttall* 600, 688, 689; Salta Verde, *Knopf* 338.

3. *P. insularis* Eastw. Proc. Calif. Acad. Sci. 3, 1: 112 (1898).

Canescent with long, fine, silky hairs, very dense on the peduncles below the spikes: leaves broadly lanceolate-acuminate, narrowed to a broad petiole, a few callous teeth on the margin, 3-nerved, 5-9 cm. long, 5-12 mm. wide; peduncles 4-10 cm. long, rather stout: spikes oblong-linear, 1-2 cm. long, 8-10 mm. wide, densely flowered: bracts broadly ovate, about equalling the calyx; corolla 2.5 mm. in diameter, with ovate-orbicular, abruptly acuminate lobes, brown at base; stamens

and style exserted; seeds two, cymbiform as in *P. Patagonica* and its allies.

Dry slopes and ridges. March and April. *Trask* many specimens collected from near sea level up to the slopes of Black Jack.

4. *P. dura* Morris, Bull. Torr. Club. 27:113 (1900).

A green sub-caulescent annual, with a hard woody root, generally short-villous, glabrous when very old: leaves crowded, erect, numerous, linear, tapering to the acute apex, callous-tipped, entire, narrowed a little to the slightly margined petiole having a semi-clasping base, about 150 mm. by 5 mm., 3-nerved, the outer very near the margin, villous to glabrate: scapes erect, stout, terete, several to numerous, equalling and surpassing the leaves, 100-250 mm. high, pubescent to villous: spikes many-flowered, conspicuous, coarse, thick, erect, cylindrical, 30 mm. by 8 mm. villous: bracts rigid, herbaceous, scarious-sided on the lower third, two or less times as long as the calyx, narrowly lanceolate, widest at the base, at least the lowest distinctly callous-tipped, 6 mm. or less by 2 mm., white villous: flowers perfect: calyx villous on the midribs, its divisions scarious, with brown rigid midribs, narrowly obovate, obtuse, 3 mm. long: corolla lobes spreading and reflexed, orbicular-ovate, obtuse, 2 mm. by 2 mm., white: stamens four, about equalling the petals: pyxis one-third surpassing the calyx, narrowly ovate, obtuse, 3 mm. by 2 mm., circumscissile below the middle: seeds two, dark brown, narrowly ovate, finely pitted.

On dry slopes and ridges. March to May. *Trask*; Pebble Beach, *Nuttall* 304.

5. *P. Parishii* Macbr. Contr. Gray Herb. 56:61 (1918).

A slender annual more or less reddish throughout, 5-10 cm. high. Stem short appressed strigose-hirsute; leaves smooth or sub-glabrous narrowly linear, somewhat attenuate, apex short cuspidate, 2-5 cm. long, 1-2 mm. broad; spikes oblong or linear-oblong, 17-22 mm. long by 3 mm. broad; dorsal bracts plainly convex, cuspidate, about 2 mm. long, minutely appressed-pubescent; sepals similar or sub-obtuse, the margins suberose-ciliate, about 2.5 mm. long; flowers disclosed, segments of the corolla narrowly lanceolate, subacuminate; capsule about 2 mm. long somewhat shorter than the sepals.

On the flat at Pebble Beach. March 31, 1916. *S. B. Parish* 10751 type. Not since found.

6. *P. coronopus* Linn. Sp. Pl. 115 (1753).

A polymorphous hirtellous annual with the fleshy leaves rosulate or erect. Leaves lanceolate-linear in general outline, sharply and acutely pinnate-dentate. Peduncles 9-16 cm. long, longer than the leaves, erect, closely strigose-hirtellous; spikes tail-like, 6-10 cm. long, 2.5-3.5 mm. thick, densely appressed flowered; bracts ovate, acute or acuminate, shorter than the calyx; corolla small, lobes lanceolate acute; pyxis circumscissile about the middle; seed oblong, flattened.

Flat situations near the sea. March to June. *Trask*; *Brandegee* (as *P. maritima*); Pebble Beach flat, *Parish* 10749, *Pendleton* 1431; *Millsp.* 4750, *Nuttall* 187; at the Isthmus, *Nuttall* 218. RAT TAIL PLANTAIN.

7. *P. speciosa* Morris, Bull. Torr. Club. 28:120 (1901).

A green acaulescent annual with a rather coarse root: leaves crowded, erect, numerous, linear, long-tapering to the acute apex, callous-tipped, with scattered slender callous teeth, the petioles not distinguishable, 70-120 mm. by 2-3 mm., 3-nerved, glabrate on the upper surface to woolly-lanate throughout: scapes ascending to erect, rather stout, several to numerous, equalling to surpassing the leaves, 70-120 mm. high, appressed pubescent: spikes many-flowered, coarse, hoary, conspicuous, erect, cylindrical, 20-40 mm. by 8 mm.: bracts rigid, herbaceous, scarious-sided below the middle about the length of the calyx, triangular-lanceolate, widest at the base, blunt at the apex, 3-4 mm. long, silky-villous: calyx divisions scarious, with brown or purple midribs, obovate-oblong, rounded, 3-3.5 mm. long: corolla conspicuous its lobes strongly reflexed orbicular-ovate, obtuse, 2 mm. by 2 mm., very white, summit of the throat very dark brown: stamens four, just exerted from the tube: style equalling the lobes: pyxis surpassing the calyx, broadly oval, obtuse, 3 mm. by 2 mm. circumscissile at or just below the middle: seeds two, very dark brown, oblong, rough.

Dry or moist sunny hillsides. March to May. *Lyon*, *Trask*, *Brandegee* (as *P. patagonica*); near Avalon, *G. B. Grant* 1000, 2412 type, 3755; *Millsp.* 4912; Schoolhouse Ridge and Equestrian Trail, *Nuttall* 10, 716; Coach Road between Howland's and Cherry Valley, *Millsp.* 4822. RIBBON PLAIN-TAIN.

[*P. obversa* Morris is reported by Abrams (Fl. Los. Ang. ed. 2:345) as "also on Catalina." This reference may be to a specimen of *P. speciosa*. We find no Catalina specimen of *P. obscura* in herbaria nor have our collectors found it on the island].

Order 24. RUBIALES.

Corolla gamopetalous. Anthers separate, the stamens as many as the corolla-lobes and alternate with them (one fewer in *Linnaea* of the Caprifoliaceæ) or twice as many. Ovary compound, inferior, adnate to the calyx-tube. Ovules 1 or more in each cavity of the ovary. Leaves opposite or verticillate.

Leaves stipulate, usually blackening in drying.

1. RUBIACEÆ.

Leaves estipulate, not blackening in drying.

2. CAPRIFOLIACEÆ.

Family 1. RUBIACEÆ.

MADDER FAMILY

Herbs, shrubs, or trees, with simple, opposite or sometimes verticillate, mostly stipulate leaves, and perfect, often dimorphous or

trimorphous, regular and nearly symmetrical flowers. Calyx-tube adnate to the ovary, its limb various. Corolla funnellform, club-shaped, campanulate, or rotate, 4-5-lobed. Stamens as many as the lobes of the corolla and alternate with them, inserted on its tube or throat. Ovary 1-10-celled; style simple or lobed; ovules 1- ∞ in each cavity. Fruit a capsule, berry, or drupe. Seeds various; seed-coat membranous or crustaceous; endosperm fleshy or horny (rarely wanting in a few genera); cotyledons ovate, cordate, or foliaceous.

I. GALIUM Linn.

Herbs, with 4-angled slender stems and branches, apparently verticillate leaves, and small flowers, mostly in axillary or terminal cymes or panicles. Flowers perfect, or in some species dioecious. Calyx-tube ovoid or globose, the limb minutely toothed, or none. Corolla rotate, 4-lobed (rarely 3-lobed). Stamens 4, rarely 3; filaments short; anthers exserted. Ovary 2-celled; ovules one in each cavity. Styles 2, short; stigmas capitate. Fruit didymous, separating into 2 indehiscent carpels, or sometimes only 1 of the carpels maturing. Endosperm horny; embryo curved; cotyledons foliaceous.

Annual, weak stemmed.	1. Aparine.
Perennial, stiff stemmed:	
Leaves in 4's, linear:	
Plants glabrous.	2. angustifolium.
Plants cinereous-puberulent.	3. siccatum.
Leaves narrowly oblong to ovate-lanceolate:	
Plants crispid-hirsute.	4. catalinense.
Leaves short, ovate, pointed.	5. miguelense.

1. *G. Aparine* Linn. Sp. Pl. 108 (1753).

Annual, weak, scrambling over bushes, 3.3-15.2 dm. long, the stems retrorsely hispid on the angles. Leaves in 6's or 8's, oblanceolate to linear, cuspidate at the apex, 2.6-7.6 cm. long, 4.2-10.5 mm. wide, the margins and midrib very rough; flowers in 1-3-flowered cymes in the upper axils; peduncles 1-3 cm. long; fruiting pedicels straight; fruit 4.2-6.3 mm. broad, densely covered with short hooked bristles.

Moist, shady situations. March to May. *Gambel, Lyon, Trask* (as *G. Vaillantii*); Coach Road at the Wishbone, *Smith 5021, Nuttall 51*; Pebble Beach Flat, *Millsp. 4753*; Equestrian Trail, *Nuttall 701*; Pebble Beach Road, *Knopf 23*. BEDSTRAW.

2. *G. angustifolium* Nutt. Gray. Bot. Calif. 1:285 (1880).

Shrubby at base with erect or ascending stems, 3.3-12.2 dm. high, glabrous: the branches rigid or strict, smooth on the angles: leaves in fours, linear, mucronate-acute, rigid, 1-nerved, veinless, with barely scabrous margins: cymes small and numerous in a narrow panicle:

flowers very small, greenish-white: fruit hispid or hirsute, with straight bristles not longer than itself.

Grassy or shrubby hillsides and sandy situations. January to June. *Lyon; Trask; Brandegee; McClatchie; Avalon Valley, Smith 4974, Macbride & Payson 842, Carlson 844, Millsp. 4771; Pebble Beach Road, Pendleton 1359, Reed 2823, Hall 8280, Hasse, Nuttall 109; foot trail to Summit, Nuttall 14, Knopf 123; Descanso Canyon, Millsp. 4500; Pebble Beach Canyon and Piedra Escalera Canyon, Nuttall 206, 700.*

3. *G. siccatum* Wright, Zoe 5:54 (1900).

Perennial, 3.3-12.2 dm. high, erect and very much branched and bushy when growing in some situations, or reclining in others; the whole plant cinereous-puberulent; leaves in fours, not rigid, linear, 8.4-16.8 mm. long, 1-2.1 mm. broad, barely mucronulate, midrib not prominent; inflorescence cymose-paniculate, flowers polygamous, greenish-yellow, numerous; fruit 2.1 mm. broad, densely hispid with straight bristles.

Overhanging banks of streamlets. January to June. Avalon Run beyond the Golf Links and in Swain's Canyon, *Millsp. 4517, 4600.*

4. *G. catalinense* Gray, Syn. Fl. Suppl. 445 (1886).

Herbaceous perennial, hispidulous-puberulent or glabrate, unarmed: stems erect, 9.1-12 dm. high, mostly simple with short flowering branches which little surpass the larger leaves; its nodes usually with a tumid ring: leaves in fives or fours, narrowly oblong, obtuse, mucronate, one-nerved (rarely by the union of two leaves 2-nerved), either sessile by a contracted base or short-petioled; at the insertion within bearing some obscurely glandular bristle-shaped appendages: flowers on short slender pedicels, perhaps polygamous: corolla white (4.2 mm. in diameter): young fruit sometimes naked and smooth, sometimes beset with soft and straight bristles of about the length of the body.

Rocky slopes and sunny cliffs. January to July. *Lyon; Trask; Brandegee; break off and rocks along Pebble Beach Road, Grant 3762, Grant & Wheeler 490/2882 (as *G. buxifolium*), Pendleton 1358, 1380, Reed 2801, Millsp. 4639, Nuttall 289, Knopf 22, 281; Rattlesnake Canyon, Millsp. 4680; Pebble Beach Canyon, Nuttall 207. CATALINA BEDSTRAW.*

5. *G. miguelense* Greene, Pitton. 1:34 (1887).

Suffrutescent, evergreen, the prostrate stems 15.3-45.8 cm. long, whole plant covered with a sparse retrorse pubescence: leaves oval, acute, 3-5 mm. long, dark green, coriaceous, in age deflexed and almost imbricated on the branches: berry large, glabrous, pearl-white: flowers not seen.

In the chaparral near Avalon. July 19, 1915. *Macbride & Payson 843* in herb. Gray, Cambridge, where it is labeled tentatively *G. grande*. The specimen agrees as well as possible with Greene's type from San Miguel.

Family 2. **CAPRIFOLIACEÆ.**

HONEYSUCKLE FAMILY

Shurbs, trees, vines, or perennial herbs, with opposite simple or pinnate leaves, and perfect, regular or irregular, mostly cymose flowers. Stipules none, or sometimes present. Calyx-tube adnate to the ovary, its limb 3-5-toothed or 3-5-lobed. Corolla gamopetalous, rotate, campanulate, funnellform urn-shaped, or tubular, the tube often gibbous at the base, the limb 5-lobed, sometimes 2-lipped. Stamens 5 (very rarely 4), inserted on the tube of the corolla and alternate with its lobes; anthers oblong or linear, versatile. Ovary inferior, 1-6-celled; style slender; stigma capitate, or 2-5-lobed, the lobes stigmatic at the summit; ovules anatropous, 1 or several in each cavity. Fruit a 1-6-celled berry, drupe, or capsule. Seeds oblong, globose, or angular; seed-coat membranous or crustaceous, smooth or cancellate; embryo usually small, placed near the hilum; radicle terete; cotyledons ovate.

Leaves pinnately compound.

1. **SAMBUCUS.**

Leaves simple:

Corolla short, campanulate, shrubs.

2. **SYMPHORICARPOS.**

Corolla long, tubular, vines.

3. **LONICERA.**

1. **SAMBUCUS** Linn.

Trees or shrubs, with stout branches containing thick white or brown pith, and buds with several scales. Leaves petiolate, unequally pinnate, deciduous, with serrate or lacinate leaflets, the base of the petiole naked, glandular or furnished with a stipule-like leaflet; stipels small, leaf-like, usually setaceous, often O; stipules small, rudimentary, usually O except on vigorous shoots. Flowers small, in broad terminal corymbose cymes, their bracts and bractlets lanceolate, acute, scarious, caducous, sometimes ebracteolate; calyx-tube ovoid, the limb 3-5-lobed or toothed; corolla rotate or slightly campanulate, equally 3-5-parted; filaments filiform or subulate; ovary inferior or partly superior, 3-5-celled; style abbreviated, thick and conic, 3-5-lobed, stigmatic at apex. Fruit subglobose, with juicy flesh, and 3-5 oblong cartilaginous punctate-rugulose or smooth 1-seeded nutlets full and rounded on the back and rounded at the ends. Seeds filling the cavity of the nutlets, pale brown; cotyledons ovoid.

1. **S. cærulea** Raf. Alsog. Ana. 48 (1838). Plate V, f. 1.

Sambucus glauca Nutt. T. & Gr. Fl. 2: 13 (1841).

Bushy or arborescent, 2-5 m. high, the largest specimens tree-like; leaves coriaceous, glabrous; leaflets 5-7, lanceolate, ovate or obovate,

mostly abruptly acuminate, serrate except at the acuminate apex, 2.5-8 cm. long; inflorescence 5-rayed, each ray again 1-3 times 5-rayed, forming a flat-topped cyme, 8-15 cm. broad; flowers white, 7 mm. broad; fruit blue beneath the white bloom.

A large tree with a trunk up to two feet diameter. On alluvial washes in the larger canyon mouths. January to May (mostly March to May). *Lyon*, *Trask*, *Brandegee*; Avalon Canyon, a large tree on the Golf Links *Smith* 5001; Pebble Beach Canyon, *Knopf* 68, 181, 243; Banning's and White's Landings, *Millsp.* 4587. ELDER, SAUCO. A tea made of the flowers, and drunk hot, induces copious perspiration.

2. SYMPHORICARPOS Dill.

Shrubs, with opposite deciduous short-petioled simple leaves, and small white or pink, perfect flowers, in axillary or terminal clusters. Calyx-tube nearly globular, the limb 4-5-toothed. Corolla campanulate or salverform, regular, or sometimes gibbous at the base, 4-5-lobed, glabrous or pilose in the throat; stamens 4 or 5, inserted on the corolla. Ovary 4-celled, 2 of the cavities containing several abortive ovules, the other two each with a single suspended ovule; style filiform; stigma capitate, or 2-lobed. Fruit an ovoid or globose 4-celled, 2-seeded berry. Seeds oblong; endosperm fleshy; embryo minute.

1. *S. mollis* Nutt. T. & Gr. Fl. 2:4 (1841).

Low, diffuse or decumbent, softly and usually densely pubescent; leaves oval, small (12.7 mm. or less than 2.6 cm. long); flowers few, in terminal clusters or in upper axils; corolla short and broad, inconspicuously bearded or pubescent inside; stamens equalling the corolla; style shorter.

Canyon bottoms in rich soil in shade. February to June. *Lyon*; *Trask*; *Brandegee*; Pebble Beach Canyon, *Eastwood* 6451 (as *S. ciliatus*); *Nuttall* 202; *Knopf* 175; *Millsp.*; Cherry Canyon, *Smith* 5088; Big Wash Canyon, *Knopf* 252; Hamilton Canyon, *Millsp.* 4704; *Nuttall* 202, *Knopf* 84; Bulrush Canyon, *Knopf* 356. SNOWBERRY.

3. LONICERA Linn.

Erect or climbing shrubs, with opposite mostly entire leaves; flowers spicate, capitate or geminate, usually somewhat irregular. Calyx-tube ovoid or nearly globular, the limb slightly 5-toothed. Corolla tubular, funnelform, or campanulate, often gibbous at the base, the limb 5-lobed, more or less oblique, or 2-lipped. Stamens 5, inserted on the tube of the corolla; anthers linear or oblong. Ovary 2-3-celled; ovules numerous in each cavity, pendulous; style slender; stigma capi-

tate. Berry fleshy, 2-3-celled or rarely 1-celled, few seeded. Seeds ovoid or oblong with fleshy endosperm and a terete embryo.

1. *L. catalinensis* Millsp. *sp. nov.*

Vitis crassa usque ad 16 m. alta; caulibus subpurpureis, minute puberulentis. Folia coriacea, ovata, 4 x 2-10 x 5 cm., basi orbiculata et plus minusve inaequalia, apiculata, facie superiore rugosa nitidaque, facie inferiore minute puberulenta; petiolis circ. 0.5 cm. longis; stipulis late ovatis, circ. 0.5 cm. latis, saepe ad multa juga foliorum absentibus. Inflorescentia verticillato-spicata usque ad 10 cm. vel plus longa, internodiis longis et minute pubescentibus, non viscidis; floribus plerumque quinque in quaque verticella, dense aurantiacis vel nitido-coccineis; calyce globoso, circ. 1.5 mm. longo, gutture constricto; dentibus triangularibus minimis coronam facientibus; corolla falcata, in gemma ad 2 cm. longitudine expandenti, intra se longo-pilosa; labro superiore anguste ovato ac apice lobis 4 ovatis vestito, labro inferiore ligulato, integro, ad tubulum retrocrispato; filamentis longo-pilosis ad circ. medium. Baccae claro-rubrae, diametro 8 mm.; seminibus 4, ovatis, complanatis, 3.2 x 2 mm.

Canyon bottoms near rivulets. May to June. Lyon (as *L. hispidula vacillans* Gray); Trask (as *L. hispidula* Dougl.); Brandegee (as *L. hispidula* and the vars. *subspicata* and *vacillans*); Palmer 7/254; McClatchie; Grant (as *L. californica*); Avalon Valley, Pendleton 1390, Reed 2380, Nuttall 91, 151, 341, 728, 766; Graveyard Canyon, Knopf 139 Type, 172; Rock Spring and Pebble Beach Canyons, Smith 5058, 5104; Big Wash Canyon and Equestrian Trail, Nuttall 876, 160; White's Landing, Hall 8272; Gallagher's Canyon "festooning the oaks. Inflorescence greasy" Jepson 3057; Swain's Canyon, Millsp. 4599; Isthmus, Eastwood 6509. WILD HONEYSUCKLE.

Order 25. CAMPANULALES.

Herbs, rarely shrubs, the corolla gamopetalous, or petals sometimes separate in Cucurbitaceae. Stamens as many as the corolla-lobes (fewer in the Cucurbitaceae); anthers united (except in Ambrosiaceae). Ovary inferior.

Flowers not in involucrate heads:

Vines, with monoecious or dioecious flowers. 1. CUCURBITACEAE.

Herbs, with perfect flowers. 2. CAMPANULACEAE.

Flowers in involucrate heads:

Flowers all expanded into rays, juice milky. 3. CICHORIACEAE.

Flowers nearly tubular, juice not milky:

Stamens distinct or nearly so. 4. AMBROSIAEAE.

Stamens united into a tube by their anthers. 5. CARDUACEAE.

Family 1. CUCURBITACEÆ.

MELON FAMILY

Herbaceous vines, usually with tendrils. Leaves alternate, petioled, generally palmately lobed or dissected. Flowers monoecious or

dioecious. Calyx-tube adnate to the ovary, its limb usually 5-lobed, the lobes imbricated. Petals usually 5, inserted on the limb of the calyx, separate, or united into a gamopetalous corolla. Stamens mostly 3 (sometimes 1), 2 of them with 2-celled anthers, the other with a 1-celled anther; filaments short, often somewhat monadelphous. Ovary 1-3-celled; style terminal, simple, or lobed; ovules anatropous. Fruit a pepo, indehiscent, or rarely dehiscent at the summit, or bursting irregularly; or sometimes dry and membranous. Seeds usually flat; endosperm none.

1. MICRAMPELIS Raf.

Mostly climbing herbs, with branched tendrils, lobed divided or angled leaves, and small white or greenish-white monoecious flowers. Calyx-tube campanulate, 5-6-toothed. Corolla very deeply 5-6-parted. Stamens 3 in the staminate flowers; the anthers more or less coherent. Pistillate flowers with a 2-4-celled ovary; style very short; stigma hemispheric or lobed. Fruit fleshy or dry at maturity, densely spiny, 1-2-celled, dehiscent at the summit.

1. *M. macrocarpa* Greene, Pitton. 2:129 (1890).

Echinocystis macrocarpa Greene, Bull. Calif. Acad. 1:188 (1885).

Nearly glabrous; stems much branched, climbing over shrubs, from a very large fusiform root; leaves about 15.3 cm. broad, with a closed sinus, 5-cleft to the middle or below it, the divisions slightly 3-5-lobed, mucronate: fruit ovoid-oblong, 7.6-12.7 cm. long, usually densely echinate with spines which, though stout are rather soft, longest often exceeding 5.1 cm., 6-14-seeded, 12 of the seeds arranged ascendingly or imbricately, in four cells, the other two lying horizontally across the base of the fruit, both attached to the same side: seed obovoid, 19 mm. long, light brown, encircled by a dark, marginal line.

Western facing canyon slopes everywhere. Blooms the year around. *Baker*, reported from a scrap only in herb. Gray, as (*Megarrhiza Marah*); *Lyon*, (as *Megarrhiza californica*); *Brandege* as (*Echinocystis fabacea* and *guadaloupensis*); *Avalon* vicinity and *Gallagher's Canyon*, *Eastwood* 6454, 6474, 6532 (as *Marah microcarpa*); *Avalon Valley*, *Smith* 5006, *Millsp.* 4481; *Descanso Canyon* and *Big Wash Canyon*, *Nuttall* 56, 914; *Rattlesnake Canyon*, *Millsp.* 4857; *Middle Ranch Canyon*, *Knopf* 274, 349. Also reported as *Marah fabacea*, *Echinocystis Marah* and *Megarrhiza fabacea*. CHILICOTHE, WILD CUCUMBER, ELEPHANT ROOT. BIG ROOT.

Family 2. CAMPANULACEÆ.

BELLFLOWER FAMILY

Herbs (some tropical species shrubs or even trees), with alternate exstipulate simple leaves, acrid and usually milky juice, and perfect

flowers. Calyx-tube adnate to the ovary, its limb mostly 5-lobed or 5-parted, the lobes equal or slightly unequal, valvate or imbricate in the bud, commonly persistent. Corolla gamopetalous, regular or irregular, inserted at the line where the calyx becomes free from the ovary, its tube entire, or deeply cleft on one side, its limbs 5-lobed, regular, or more or less 2-lipped, or corolla rarely divided into separate petals. Stamens 5, alternate with the corolla-lobes, inserted with the corolla; filaments separate or connate; anthers 2-celled, introrse, separate, or united into a ring or tube. Ovary 2-5-celled (rarely 6-10-celled), with the placentae projecting from the axis, or 1-celled with two parietal placentae; style simple; stigma mostly anatropous. Fruit a capsule or berry. Seeds numerous, small; embryo minute, straight; endosperm fleshy.

1. SPECULARIA Heist.

Annual herbs, with alternate toothed or entire leaves, the stem and branches long, slender. Flowers axillary, sessile or nearly so, 2-bracted, or the upper paniced in some exotic species, the earlier (lower) ones small, cleistogamous, the later with a blue or purple nearly rotate corolla. Calyx-tube narrow, the lobes in the earlier flowers 3 or 4, in the later 4 or 5. Corolla 5-lobed or 5-parted, the lobes imbricated in the bud. Filaments flat; anthers separate, linear. Ovary 3-celled (rarely 2- or 4-celled); ovules numerous; stigma usually 3-lobed. Capsule prismatic, cylindric, or narrowly obconic, opening by lateral valves. Seeds ovoid, oblong, or lenticular.

1. **S. biflora** (R. & P.) F. & M. Ind. Sem. Hort. Petrop. 1:17 (1835).
Campanula biflora R. & P. Fl. Peru, 2:55 (1799).
Legousia biflora Britton, Mem. Torr. Club 5:309 (1894).

Glabrous, or nearly so; stem simple or branched, very slender, roughish on the angles, 1.5-5.1 cm. high. Leaves ovate, oblong or the upper lanceolate, sessile, acute or obtuse at the apex, crenate with a few teeth, or entire, 8.4-21 mm. long, or the upper smaller; earlier flowers with 3 or 4 ovate to lanceolate calyx-lobes, those of the later flowers 4 or 5, lanceolate-subulate, longer; capsule oblong-cylindric, 6.3-10.5 mm. long, opening by valves close under the calyx-teeth.

In canyon bottoms generally in shade under somewhat moist banks. May to June. Pebble Beach Canyon, *Trask* who mentions (*Eryth.* 7:141) finding an abnormal specimen having 4 stigmas and 6 stamens. The following specimens are all normal: *Brandegee*; Pebble Beach Road and Cherry Canyon, *Smith* 5060, 5085; at the sharp angle of the Equestrian Trail, *Nuttall* 246. VENUS' LOOKING-GLASS.

Family 3. **CICHORIACEÆ.**

CHICORY FAMILY

Herbs (in our genera), almost always with milky, acrid or bitter juice, alternate or basal leaves and yellow, rarely pink, blue, purple or white flowers in involucrate heads. Bracts of the involucre in 1 to several series. Receptacle of the head flat or flattish, naked, scaly (paleaceous), smooth, pitted or honeycombed. Flowers all alike (heads homogamous), perfect. Calyx tube completely adnate to the ovary, its limb (pappus) of scales, or simple or plumose bristles, or both, or wanting. Corolla gamopetalous with a short or long tube and a strap-shaped (ligulate) usually 5-toothed limb (ray). Anthers connate into a tube around the style the sacs sagittate or auricled at the base, not tailed, usually appendaged at the summit, the simple pollen-grains usually 12-sided. Ovary 1-celled; ovule 1 anatropous; style very slender, 2-cleft or 2-lobed, the lobes minutely papillose. Fruit an achene. Seed erect; endosperm none; radicle narrower than the cotyledons.

Pappus none or paleaceous.

Pappus of plumose bristles:

Achenes truncate.

Achenes beaked.

Pappus of capillary bristles:

Achenes not flattened:

Achenes beakless, plants caulescent.

Achenes beaked, plants acaulescent.

Achenes flattened:

Achenes beaked.

Achenes beakless.

1. **MICROSERIS.**

2. **STEPHANOMERIA.**

3. **RAFINESQUEA.**

4. **MALACOTHRIX.**

5. **TARAXACUM.**

6. **LACTUCA.**

7. **SONCHUS.**

1. **MICROSERIS** Don.

Herbaceous plants, mostly acaulescent or short-stemmed, glabrous or slightly puberulent. Leaves chiefly in a basal tuft, pinnatifid with mostly linear and often falcate lobes or entire in the same species. Peduncles 1-headed. Main bracts of the involucre nearly equal but with short outer ones at base, or unequal and loosely imbricated. Ligules short, yellow, inconspicuous in dried specimens. Achenes slender-fusiform or turbinate or cylindric, ribbed, mostly truncate. Pappus: paleæ 5-10, each with a more or less elongated scabrous or short-plumose awn.

Achenes attenuate to a beak: pappus white or brownish.

Achenes truncate: pappus dull brown or sordid.

1. **linearifolia.**

2. **Lindleyi.**

1. *M. linearifolia* (DC.) Sch-Bip. Poll. xii-xxiv: 308 (1866).

Calais linearifolia DC. Prodr. 7:85 (1874).

- Uropappus linearifolius* Nutt. Proc. Am. Phil. Soc. 2, 7:425 (1841).

Microseris anomala Wats. Proc. Am. Acad. 22:475 (1887).

Plant from 1-4 or 6 dm. high: stems or peduncles often several from the base, erect, the peduncle in robust plants thickened or fistulous under the oblong head: leaves linear, 8-15 cm. long, 1-5 mm. wide and with 2 or 3 to several pairs of more or less salient lobes, or entire; achenes attenuate above into a beak, usually black; pappus deciduous, from silvery white to sordid, 12-15 mm. long including the very delicate awn, this about one-half the length of the deeply notched palea.

On grassy hillsides. *Brandegee*; Cherry Canyon, *Smith* 5089; *Nuttall* 29, 52, 345, 554, 719; Isthmus Road 747; *Knopf* 36; Bulrush Canyon, *Knopf* 401; Pebble Beach Canyon, *Mills* 4835.

2. *M. Lindleyi* (DC.) Gray, Proc. Am. Acad. 9:210 (1874).

Calais pleuriseta Greene Pitton. 1:30 (1887).

Stem short or scarcely any but the stout naked scapes or scape-like peduncles usually 2-5 dm. high, scarcely thickened under the head; herbage glabrous or furfuraceous-puberulent when young; leaves as in the previous species but rather broader; achenes commonly reddish-brown to gray, slightly narrowed toward the truncate summit; pappus dull-brown or sordid, persistent, at maturity 12-15 or 18 mm. long including the awn which rises from a shallow notch and is but little shorter than the mature palea.

In similar locations to the last species. *Brandegee* list; Catholic Church and Rattlesnake canyons, *Mills* 4799, 4858.

2. STEPHANOMERIA Nutt.

Tall and rather slender herbs the stems either strict or paniculately branched. Upper leaves reduced to herbaceous bracts. Heads small, 3-20-flowered. Flowers pink or flesh-color, open in the early morning, ligules all equal. Involucre cylindric or rarely campanulate. Receptacle flat. Achenes oblong, short-linear or somewhat turbinate, strongly angled, glabrous, often rugose, truncate at each end the broad base hollowed at the insertion. Pappus-bristles white or sordid, more or less plumose.

1. *S. virgata* Benth. Bot. Sulph. Voy. 32 (1844).

Ptiloria virgata Greene, Pitton. 2:130 (1890).

Stems rigid, virgate or with usually virgate branches, sometimes widely and paniculately branched, 3-20 or even 40 dm. high; herbage usually glabrous; lower leaves oblong or spatulate, often sinuate or pinnatifid; upper leaves linear small and entire; heads sessile along

the naked branches, mostly 4-16-flowered; involucre 7 mm. high; ligules reddish-purple on the back, lighter on the upper surface, sometimes clear white; achenes subclavate or oblong, longitudinally ribbed, the interspaces more or less rugose and traversed by a deep, narrow groove; pappus clear white, plumose almost throughout, fragile but the base commonly persistent.

Open, dry, bare hillsides. January to July. *Brandegee*, Lyon (as *Stephanomeria paniculata*, Nutt.); Avalon, *Eastwood* 6530; *Rusby* (N. Y., field); Descanso Canyon, *Mills* 4534; Avalon vicinity, *Nuttall* 354, 603, 1009; *Knopf* 255.

3. RAFINESQUEA Nutt.

Stout and sometimes fistulous glabrous branching annuals. Leaves toothed or pinnatifid. Panicle more or less cymosely branching. Heads 15-30-flowered. Involucre in anthesis conical-cylindraceous. Flowers white, the outer ligules more or less tinged with rose-color; ligules unequal. Receptacle flat, naked. Achenes terete, with a few obscure ribs, excavated at the insertion but with callous thickening. Pappus-bristles capillary, 10-15, long-plumose from the base to near the tip.

1. *R. californica* Nutt. Trans. Am. Phil. Soc. 2, 7:429 (1841).
Nemoseris californica Greene, Pitton. 2:193 (1891).

Robust, branching above, 3-25 dm. high; leaves oblong in outline, pinnatifid to denticulate or almost entire, sessile and auriculate-clasping or the lowermost narrowed to a winged petiole, 15 cm. more or less long; those of the inflorescence much reduced and often spinulose-toothed and angular; involucre 16-18 mm. high or 11-15 or even 22 linear or lanceolate-acuminate, main bracts with some loose subulate ones at the base; ligules short, white; beak of the achene as long as the body; pappus dull white.

Open dry places in scrublands. June to August. *Brandegee* list; sea cliffs near Avalon, *Nuttall* 293.

4. MALACOTHRYX DC.

Chiefly herbaceous plants, a few woody at base, commonly with a radical cluster of leaves, the stems either leafy or almost naked. Heads small or medium size, solitary or paniced, never sessile, commonly nodding in the bud. Flowers yellow, white or pinkish. Receptacle bristly or naked. Achenes short, truncate at apex, crowned with an entire or denticulate border, 10-15-ribbed, terete, or 4 or 5 of the ribs stronger than the others rendering the achene somewhat 4-5-angled. Pappus-bristles soft, scabrous, more or less united at the base and falling away together, or with 1-8 stronger ones which are more persistent.

1. **M. saxatilis** (Nutt.) T. & G. Fl. 2:446 (1842).*Leucoseris saxatilis* Nutt. Trans. Am. Phil. Soc. 2, 7:440 (1841).

Diffuse or decumbent from a suffrutescent base, 3-6 or more dm. high; herbage succulent, minutely tomentose when young; leaves lanceolate to spatulate, mostly obtuse and entire but some of the lower ones toothed or pinnatifid; involucre 10-15 mm. high, its branches linear-attenuate, the outer ones very short; ligules white or centrally striped with rose or with a broad deep purple line; achenes 10-15 ribbed about 5 of the ribs stronger than the others, crowned with a minute denticulate white border; persistent pappus-bristles none.

On shelving rocks and loose gravelly talus near the sea. December to July. *Brandegee*; *Lyon*; Sea shore near Avalon, *Trask*, *Smith* 5036; *Reed* 2820; *Hall* 8279; *Pendleton* 1355; *Eastwood* 6445; *McClatchie* (N. Y., Field); *White's Valley*, *Knopf* 146, 254; *Mills* 4471; *Nuttall* 271, 1010, 1150; *Swain's Canyon*, 623. SNAKE'S HEAD, LAVA DAISY.

5. **TARAXACUM** Haller.

Perennial acaulescent herbs with pinnatifid or toothed leaves all in a basal tuft and large heads of yellow flowers terminating usually simple and naked hollow scapes. Principle bracts of the involucre nearly equal, the outer much shorter and in several series. Receptacle flat, naked. Rays 5-toothed at the truncate summit. Achenes oblong or linear-fusiform, 4 or 5-angled, 5-10-nerved, somewhat spinulose above, tapering into a slender beak bearing at its summit a copious pappus of unequal persistent bristles.

1. **T. Taraxacum** (Linn.) Karst. Deutsch. Fl. 1138 (1880-3).*Leontodon Taraxacum* Linn. Sp. Pl. 798 (1753):*Taraxacum vulgare* Schrank Prim. Fl. Salisb. 193 (1792).*Taraxacum officinale* Web. Prim. Pl. Holst. 56 (1780).*Taraxacum Dens-Leonis* Desf. Fl. Atlan. 2:228 (1800).

Root thick, long, bitter; leaves oblong or spatulate in outline, irregularly dentate to sinuate-pinnatifid, from a few cm. to approximately 3 dm. long, usually pubescent when young and somewhat succulent; inner bracts of the involucre linear or linear-lanceolate, acute, 10-15 mm. long, outer ones similar but shorter, reflexed; flowers yellow; pappus brownish or white raised in a globular mass upon the long, filiform beak of the achene.

A European immigrant, hardly, as yet naturalized. A single specimen found in a lawn at Avalon, *Mills* 4883. DANDELION.

6. **LACTUCA** Tourn.

Tall leafy-stemmed herbs with panicked heads of yellow flowers (in our species). Leaves alternate. Involucre cylindrical or conical

when in fruit, its bracts imbricated in two or more series of unequal lengths. Rays 5-toothed at summit. Achenes obcompressed, *i.e.* flattened parallel to the bracts, 1-5-nerved on each face, contracted into a beak which bears at its dilated summit a copious very soft and white, or brown, capillary pappus the hairs of which fall separately.

1. *L. virosa* Linn. Sp. Pl. 795 (1753).

Lactuca Scariola Linn. Sp. Pl. ed. 2:1119 (1763).

Biennial, green and glaucous; stem stiff, leafy, usually paniculately branched, glabrous throughout or bristly hirsute at the base, 18-70 dm. high. Leaves oblong or oblong-lanceolate, spinulose margined, pinnatifid or denticulate, sessile or auriculate clasping, the lowest sometimes 25 x 8 dm., the upper much smaller; midrib spinulose or hispid; heads 4-8 mm. broad, 6-12-flowered, very numerous in an open panicle; involucre cylindric, 2-3 mm. thick, its outer bracts about one-third the length of the inner; rays yellow; achenes obovate-oblong, about as long as the filiform beak; pappus white.

Dry, gravelly situations. July to August. Arroya of Rock Spring canyon near the road bridge, *Nuttall 604*. PRICKLY LETTUCE.

Our Catalina specimens represent a *form* that, while presenting the usual leaf form of the species, has strong hispid-pubesence on both surfaces of the leaves as well as on the midribs and margins, and the branches of the inflorescence. Of this Prof. B. L. Robinson says: "I have spent some time searching for any mention of such a variation and have consulted a good many European Floras but entirely without success. I find no material of the species in the Gray Herbarium which shows a similar hispidity either among our American or Old World specimens. Further search might disclose some account of this peculiarity which is sufficiently noteworthy to put your Catalina specimens on record."

7. *SONCHUS* Linn.

Leafy-stemmed coarse succulent herbs, chiefly smooth and glaucous. Heads cymose or umbellate, swollen at the base or jug-shaped. Involucral bracts few, thin, with many shorter ones at the base; these becoming callous-thickened. Flowers yellow. Achenes obcompressed, ribbed, not beaked. Pappus copious of cottony-white exceedingly soft and fine hairs, mainly falling together.

Involucral bracts thick, fleshy.

Involucral scales thin:

Achenes minutely rugose-scabrous.

Achenes smooth.

1. *tenerrimus*.

2. *oleraceus*.

3. *asper*.

1. *S. tenerrimus* Linn. Sp. Pl. 794 (1753).

Much branched, 3-10 dm. or less high, very leafy up to the short pendunculate heads; herbage glabrous; leaves oblong in outline the linear or narrowly lanceolate lobes commonly cuspidate and either spinu-

loosely denticulate or entire; bracts thick and fleshy at their bases; achenes longitudinally striate and transversely rugose.

A native of Europe introduced on several of the Channel Islands where it has the appearance of being native.* On rocks, in clefts, of a water course and on moist slopes, *Trask* (N. Y., Field); *Brandege*; in the dry bed of the canyon south of Chicken Johnny's, *Mills* sp. 4544. Cherry Cañon, *Smith* 5089a, *Knopf* 224.

2. *S. oleraceus* Linn. Sp. Pl. 794 (1753).

A nearly simple-stemmed annual, 3-30 dm. high; leaves with the terminal segment commonly large and triangular, denticulate or toothed; lower leaves petioled; uppermost sessile and commonly lanceolate; peduncles occasionally glandular-hirsute; involucre 8-16 mm. high, the bracts thin; achenes longitudinally ribbed and transversely rugose.

A native of Europe now established as a weed in waste places. January to June. Moist situations near Avalon, *McClatchie*; *Mills* sp. 4528, 4714, 4884; *Nuttall* 574. SOW THISTLE.

3. *S. asper* (Linn.) Hill, Herb. Brit. 1:47 (1769).
Sonchus oleraceus asper Linn. Sp. Pl. 794 (1753).

Very similar to the preceding species, but the leaves sometimes undivided and commonly clasping by an auricled base, the auricles rounded; margins spinulose-denticulate; peduncles often conspicuously hirsute with spreading gland-tipped hairs; achenes flat, margined with a narrow wing and longitudinally ribbed, the intervals between the ribs smooth but the ribs as well as the marginal wing rugulose.

A native of Europe now commonly established in California with the previous species. January to June. *Trask* (N. Y., Field); *Brandege*. Waste grounds in the vicinity of Avalon, *Smith* 4981, 4982; *Mills* sp. 4539; *Nuttall* 93, 173; Gallagher's Canyon and Middle Ranch, *Mills* sp. 4864; 4603; *Knopf* 45, 222; growing 7 feet high in Cottonwood Canyon, *Knopf* 380. PRICKLY SOW THISTLE.

Family 4. AMBROSIACEÆ.

RAGWEED FAMILY

Annual or perennial herbs, monœcious or sometimes diœcious, many of them weeds; some shrubby; leaves alternate or the lower opposite; heads small composed of greenish or white flowers subtended by an involucre of few, separate or united, bracts, the pistillate heads sometimes larger and nut- or bur-like. Staminate and pistillate flowers

*Thos. Nuttall collected this species at San Diego and, considering it a native species peculiar to California named his plant *Sonchus tenuifolius* in Trans. Am. Phil. Soc. n. s. 7:438 (1841). San Diego, *Mills* sp. 4427.

in the same heads or in separate heads. Receptacle chaffy. Pistillate flowers with no corolla or this reduced to a short tube or ring; calyx adnate to the 1-celled ovary, its limb none or a mere border; style 2-cleft. Staminate flowers with a funnellform, tubular or obconic 4-5-lobed corolla; stamens mostly 5, separate, or their anthers merely connivent, not truly syngenesious, with short inflexed appendages; ovary rudimentary; summit of the style often hairy or pencillate.

Staminate heads with united involuclral bracts:

Pistillate involucre prickled in one row only.

Pistillate involucre prickled in several rows.

Staminate heads with separate involuclral bracts:

Pistillate involucre prickly throughout.

1. AMBROSIA.

2. GAERTNERIA.

3. XANTHIUM.

1. AMBROSIA Linn.

Coarse perennial monœcious herbs in our flora with mainly alternate pinnatifid leaves and inconspicuous greenish flowers. Staminate heads nodding, in erect ament-like leafless racemes; involuclral bracts united into a broadly turbinate cup; receptacle with slender bracts subtending at least the outer flowers; corollas funnellform, 5-lobed. Pistillate heads in the axils of the upper leaves at the base of the staminate racemes; involucre oblong or turbinate, closed, containing but a single flower; corolla none; pappus none; fruit an achene-like bur which is beaked or pointed and commonly armed near the tip with a single row of prickles.

1. *A. psilostachya* DC. Prodr. 5:526 (1836).

Stems simple, erect, commonly 5-10 dm. high from slender running rootstocks; herbage scabrous or short-hirsute, somewhat strigose; leaves once or the lower twice pinnatifid with acute lobes; fruit an ovoid, turgid bur about 3 mm. long, mostly solitary in the axils, pubescent, rugose-reticulate, bearing 4 protuberances, or sometimes unarmed.

A weed of waste places. July and August. *Trask* (N. Y., Field); *Brandegee*; in the creek bed at Middle Ranch and fields at the Isthmus, *Nuttall* 661, 810. WESTERN RAGWEED.

2. GÆRTNERIA Med.

Herbs or shrubs with chiefly alternate leaves and in habit flowers and inflorescence similar to *Ambrosia*. Pistillate heads 1-4-flowered; the involucre closed, 1-4-celled and 1-4-beaked or beak-pointed; prickles in several rows causing the fruit to become a bur.

1. *G. bipinnatifida* (Nutt.) Ktze. Rev. Gen. 1:339 (1891).
Franseria bipinnatifida Nutt. Tr. Am. Phil. Soc. 2, 7:344 (1841).
Franseria bipinnatifida dubia Eastw. Proc. Calif. Acad. Sci. 3,
 1:117 (1897).

Stems procumbent, 6-10 dm. long from an herbaceous perennial root, somewhat hirsute; leaves 3-10 cm. long, twice or thrice pinnately parted into oblong lobes, canescent or almost silky; staminate heads in dense terminal spikes or racemes; fruiting involucre ovate-fusiform armed with thick, somewhat flattened, spines, some of which are curved at the tip but not at all hooked.

Coastal sands and dunes. July to August. *Trask*; *Brandege*; *Howland's Landing*, *Nuttall 808*; *Little Harbor*, *Knopf 196*.

3. **XANTHIUM** Linn.

Coarse annual weeds with widely branching and very stout stems. Leaves alternate, toothed or lobed, petioled. Heads unisexual, the flowers greenish. Staminate heads subglobose, in a terminal cluster; involucre of several distinct narrow bracts in 1 or 2-series; receptacle cylindrical; flowers many, separated by the bracts of the receptacle; corolla tubular. Pistillate heads axillary, below the staminate; involucre closed forming, in fruit, an ovoid or oblong indurated bur covered with hooked prickles, 1 or 2-beaked, 2-celled each cell containing one flower, corolla none; pappus none; style 2-cleft its branches exerted through a canal in the beaks.

Plants spinous, bur about 1 cm.

Plants not spinous, bur about 3 cm.

1. spinosum.

2. pennsylvanicum.

1. *X. spinosum* Linn. Sp. Pl. 987 (1753).

Stem puberulent, much branched; leaves lanceolate or ovate-lanceolate, acute or acuminate, 2-4-lobed, the upper sometimes entire, narrowed at the base into a short petiole, green above white pubescent beneath, axillary spines 2.5 cm. long, 3-pronged, yellow; corolla pubescent with short, rusty hairs; fruit narrowly oblong, 10-12 mm. long, sparsely beset with weak, hooked prickles, beaks inconspicuous, commonly one rudimentary the other spine-like.

Stony places and bottoms. January to September. Rock Spring Canyon arroya, *Mrs. Trask* (N. Y., Field). She says (1902): "rare, one locality only"; *McClatchie*; *Smith 5168*; *Mills* 4500; field border beyond the saw mill, *Nuttall 251*; *McClatchie* (N. Y., Field). A large patch of the plant grows on the level above the stream in Cape Canyon about three-quarters of a mile up from the bridge at Middle Ranch—*Mills*. SPINY CLOTBUR.

2. **X. pennsylvanicum** Wallr. Beitr. Bot. I, II:236 (1844).
Xanthium californicum and *acutum* Greene, Pitton. 4:62 (1899).
Xanthium canadense of various Los Angeles Co. records.

Stems somewhat slender, scabrous or smooth below, 3-9 dm. high; leaves deltoid-ovate or cordate, acute, 3-5-lobed, minutely setose and appressed scabrous 0.7-2 dm. long equal to or exceeding the leaves; fruits narrowly cylindrical, oblong, ovate-fusiform or ovoid, the body glabrous or glabrate or with short glandular pilosity, 1-2 cm. long by 5-8 mm. thick, openly prickled; beaks slender or thick glandular-pubescent below smooth near the always incurved apex, 4-6 mm. long, mostly sub-remote, strict and diverging.

A common weed along ditches and in waste places on the mainland. Only found, on Catalina, along Marilla Ave. and its extension around Reservoir Hill. December to September. *Millsp.* 4470, 4475; *Nuttall* 790; Banning Valley, *Knopf* 187. COCKLEBUR.

Family 5. CARDUACEÆ.

THISTLE FAMILY

Herbs, rarely shrubs with watery or resinous sap and opposite alternate or basal estipulate leaves. Flowers perfect, pistillate, or neutral, or sometimes monœcious or diœcious, borne on a common receptacle forming heads subtended by an involucre of few to many bracts arranged in one or more series. Receptacle naked or with chaffy scales subtending the flowers, or variously pitted or honey-combed. Calyx-tube completely adnate to the ovary, the limb (pappus) of bristles, awns, teeth, scales, or crown-like or cup-like, or wanting. Corolla tubular, usually 5-lobed or 5-cleft, the lobes valvate or that of the marginal flowers of the head expanded into a ligule (ray); when the ray florets are absent the head is said to be discoid; when present, radiate; the tubular flowers form the disk. Stamens usually 5, borne on the corolla and alternate with its lobes, their anthers united into a tube (syngenesious), often appendaged at the apex, sometimes tailed at the base, or sagittate; pollen-grains globose, often rough or prickly. Ovary 1-celled; ovule 1, anatropous; style of the fertile flowers 2-cleft, its branches often variously appendaged; stigmas marginal; style of fertile flowers commonly undivided. Fruit an achene. Seed erect; endosperm none; embryo straight.

Corollas tubular, all regular (heads discoid) or only the marginal ligulate (heads radiate):

Anthers not tailed at base:

Receptacle naked.

Style-branches thickened upward. Tribe 1. EUPATORIEÆ.

Style-branches not thickened upward:

Involucral bracts imbricated:

Style branches flattened and with

- distinct terminal appendage. Tribe 2. ASTEREEAE.
 Style branches truncate, not
 appendaged. Tribe 3. ANTHEMIDEAE.
 Involucral bracts in few series:
 Pappus of paleae, awns or bristles. Tribe 4. HELENEAE.
 Pappus of numerous fine
 bristles. Tribe 5. SENECTIONIDEAE.
 Receptacle with chaffy bracts:
 Heads not unisexual, anthers united:
 Bracts not infolding ray achenes. Tribe 6. HELIANTHEAE
 Bracts infolding ray achenes. Tribe 7. MADIEAE.
 Anthers tailed at base.
 Anthers unappendaged at tip. Tribe 8. INULEAE.
 Anthers strongly appendaged
 at tip. Tribe 9. CYNAREAE.
 Corollas all bilabiate, anthers tailed. Tribe 10. MUTISIEAE.

Tribe 1, *EUPATORIEAE* — Herbs and shrubs with opposite or alternate mostly undivided leaves. Receptacle flat or somewhat convex, rarely spherical, usually naked. Heads always discoid and the flowers hermaphrodite-fertile. Corolla regular, purple, reddish, bluish or white, never yellow. Anthers not tailed at the base. Style-branches semi-cylindric, elongated, more or less clavate or thickened upward, obtuse, stigmatic lines only near the base and inconspicuous.

1. BRICKELLIA ELL.

Herbs or undershrubs (our species woody-stemmed perennials) with opposite or alternate veiny leaves. Heads small or medium-sized. Involucre cylindric to campanulate, 5-50-flowered; bracts chartaceous or membranaceous, striate, the outer ones successively shorter in most species. Receptacle naked. Corollas white or whitish, slender, 5-toothed at summit, the teeth mostly glandular externally. Achenes 10-costate. Pappus a single series of scabrous or plumose capillary bristles.

1. *B. californica* (T. & G.) Gray, Pl. Fendl. 64 (1849).

A straggling, moderately branched bush, 5-10 dm. high; herbage minutely puberulent to thinly tomentose; leaves alternate, ovate, crenate-dentate, mostly 2-4 cm. long, short-petiolate, usually with broad truncate or subcordate base but the small upper ones narrowed to the petiole; heads in small clusters terminating lateral branchlets of the leafy panicle, or the branchlets very short, the inflorescence then an interrupted strict thyrsus; involucre 9-11 mm. high, 10-15-flowered; outer bracts roundish, very obtuse; inner bracts narrower, the innermost linear and somewhat acute.

Gravelly stream-beds and chaparral slopes. June to September. *Brand-gee; Lyon; Avalon valley beyond the Saw Mill, Nuttall 829.*

Our specimens grew in rich soil on the borders of a cultivated field and have much larger leaves than usual elsewhere (up to 7 x 6 cm.).

Tribe 2, *ASTEREÆ* — Ours all herbs or shrubs with alternate leaves and scentless herbage (but sometimes resinous or gummy). Bracts of the involucre commonly well imbricated (nearly equal in *Erigeron* and *Conyza*). Receptacle naked in our genera. Disk flowers mostly yellow, perfect in all ours save *Baccharis*. Rays present or wanting. Anthers obtuse at the base. Style-branches of perfect flowers flattened, conspicuously margined by the stigmatic lines, tipped with a hispid or papillose appendage (this character sometimes quite obsolete). Pappus mostly of awns or bristles not truly paleaceous in Catalina genera.

- | | |
|---|------------------|
| Rays present, yellow: | |
| Ray achenes without pappus. | 1. HETEROTHECA. |
| Ray achenes with pappus. | |
| Annuals. | 2. PENTACHAETA. |
| Perennials. | 3. SOLIDAGO. |
| Rays present, not yellow: | |
| Pappus reduced, scanty or wanting. | 4. CORETHROGYNE. |
| Pappus well developed: | |
| Rays longer than the diam. of disk. | 5. ERIGERON. |
| Rays not longer than the diam. of disk. | 6. LEPTILON. |
| Rays none: | |
| Stems suffrutescent: | |
| Flowers permanent yellow. | 7. ISOCOMA. |
| Flowers yellow, turning brown. | 8. HAZARDIA. |
| Flowers whitish. | 9. BACCHARIS. |
| Stems herbaceous. | 10. CONYZA. |

I. *HETEROTHECA* Cass.

Tall hairy herbs with alternate toothed leaves and radiate heads of yellow flowers in a terminal cymose panicle. Involucre hemispheric or broadly campanulate its narrow bracts closely imbricated in many series. Both ray and disk-flowers numerous and fertile. Ray-achenes triangular-compressed with flat sides and narrow beak, their pappus none or caducous. Disk-achenes compressed, silky-hirsute, their pappus double, the copious inner bristles long, capillary and scabrous, the outer of short bristles or scales.

1. *H. grandiflora* Nutt. Trans. Am. Phil. Soc. 2, 7:315 (1841).
Diplopappus scaber Hook. Fl. Bor. Am. 2:22 (1829). Excl. syn.

Usually simple below, 5-20 dm. high; herbage villous-hispid or hirsute the inflorescence viscid-glandular and strong-scented; leaves ovate varying to elliptic or oblong, serrate; the radical and lower cauline long-petioled, the upper sessile, commonly with a pair of stipule-like lobes at the base; heads numerous and in an open panicle when flowering in the autumn, few and scattered at other seasons; involucre 7-9 mm. high; rays about 30; pappus of disk-flowers as long or longer than the achene, in age brick-red, its outer series inconspicuous.

Common along ditches and in open, dry, waste places up to 1200 ft. January to October. *Mills* p. 4494; *Nuttall* 175, 570, 607, 611, 847, 864; *Knopf* 119, 215, 250.

2. **PENTACHÆTA** Nutt.

Low and very slender annuals with narrowly linear and entire alternate leaves. Heads small, solitary or somewhat clustered at the ends of more or less naked branches, nodding in the bud. Receptacle convex. Involucre turbinate-campanulate, its bracts in 2 series, narrowly oblong, thin or membranous, scarious margined, mucronulate, appressed. Disk-corollas yellow or rose-red, very slender; rays white, pink, yellow or none. Achenes oblong, flattened, hirsute-pubescent. Pappus of 5-12 slender bristles, often much reduced or all obsolete.

1. **P. Lyoni** Gray, Syn. Fl. 1, 2:445 (1884).

Erect, simple below or branched throughout, 1-5 dm. high. herbage lightly pubescent, at least the stems glabrate; leaves 2-5 cm. long; involucre about 5 mm. high, conspicuously hirsute with slender hairs; bracts nearly equal, linear, acute to subulate-acuminate, with green midrib and scarious margins; flowers golden-yellow; pappus bristles varying from 8-12 in number, somewhat dilated at base.

Open, dry situations. March to September. *Lyon* (Gray, Field);* *Brandege*.

3. **SOLIDAGO** Linn.

Perennial herbs with alternate leaves. Heads small, the raceme-like clusters aggregated into a pyramidal or spike-like panicle, or in one California species the heads cymose. Bracts of the involucre narrow, thin or chartaceous, mostly destitute of herbaceous tips, imbricated in 2 or more series. Rays short, yellow as also are the disk-flowers. Pappus-bristles slender, numerous, in one or two series, equal and dull white in our species. Achenes terete, 5-12-nerved.

1. **S. californica** Nutt. Trans. Am. Phil. Soc. 2, 7:328 (1841).

Stems rigid, simple below the terminal panicle, the whole plant 6-12 dm. high or in the mountains sometimes only 1.5 dm.; herbage green and scabrous or grayish with a minute rough pubescence; leaves oblong, acute at apex, tapering below to a narrow base or short petiole;

*Lyon says, Bot. Gaz. 11:201: "A new species of *Pentachaeta*, found originally near San Pedro in the spring of 1884 and confined to the area of a few square yards, was the following year traced to its original habitat on Catalina Island. The spot where found on the mainland has been for twenty-five years past constantly used for pasturing sheep just disembarked from that island, and the case cited is probably as direct evidence of the agency of animals in seed distribution as any that could be quoted; nevertheless, with every circumstance conspiring during very many years to favor its introduction in manifold, the total "crop" of 1884 might readily have been the product of one fertile akene growing and maturing the previous year."

the lower varying to oblong-ovate and serrate, obtuse, sometimes 1 dm. long; the upper smaller, narrow and entire; panicle usually compact and 5-20 cm. long, composed of raceme-like clusters (reduced to a simple raceme in dwarf plants, the branches numerous, elongated, and somewhat secund in well developed forms); involucre 4 mm. high; bracts oblong-linear or lanceolate, rather obtuse, somewhat pubescent; rays 7-12, light yellow, 2 mm. long; disk-flowers rather more numerous; achenes pubescent.

Dry, open situations. July to December. Known to us only from one locality, *Trask* (N. Y., Field). GOLDENROD.

4. CORETHROGYNE Nutt.

Perennial herbs, some suffrutescent at base resembling *Aster*, flowering mostly in summer and autumn. Herbage whitened when young with a cottony tomentum which is often deciduous in age. Heads solitary, or cymose, or paniculate. Involucre hemispheric to turbinate, the bracts with green or herbaceous tips. Rays violet-blue or purple; disk yellow. Anthers tipped with subulate appendages. Style-appendages flat, truncate, cymose or with a bearded tuft at summit. Achenes pubescent, those of the ray sterile. Disk-pappus reddish-brown, of rigid capillary bristles; ray-pappus reduced or wanting.

1. *C. filaginifolia* (H. & A.) Nutt. Trans. Am. Phil. Soc. 2, 7:290 (1841).

Aster? filaginifolius H. & A. Bot. Beechy 146 (1833).

Slender, erect 5-10 dm. high, woody below; herbage arachnoidly tomentose, the tomentum sometimes deciduous, the inflorescence then glabrous or minutely glandular; leaves oblong-spatulate or oblanceolate, the lower ones narrowed to a petiole and sparingly serrate toward the apex, the upper sessile and inclined to be entire, those of the inflorescence reduced to bracts; heads solitary and terminal on the branchlets or more numerous and loosely panicled; involucre campanulate or broadly turbinate, 7-8 mm. high or more, its bracts imbricated in 4 or 5 series, narrowly lanceolate, erect; rays 15-25, violet.

Open, dry situations generally. January to October. Common. *Trask* (N. Y., Field); *Reed* 2816, 2835; *Pendleton* 1394; *McClatchie* (N. Y., Field); *Knopf* 229, 276; *Millsp.* 4619, 4620; *Nuttall* 198, 657, 894.

There are many forms or races of this species, varying in vegetative characters, on Catalina as well as on the mainland. We can not appreciate specific distinction in Greene's *Corethrogyne lavandulacea* (Leaf. 2:27, 1910), collected by Mrs. Trask, Sept., 1898, from his description. We have not seen his type.

5. ERIGERON Linn.

Branching or scapose herbs with alternate or basal leaves and corymbose, paniculate or solitary, peduncled heads of both tubular and

radiate (rarely all tubular) flowers. Involucre hemispheric, cylindric or campanulate, its bracts narrow, nearly equal, mostly imbricated in but 1 or 2 series. Receptacle nearly flat, usually naked. Ray-flowers white, violet or purple, pistillate. Disk-flowers yellow, tubular, perfect, their corollas mostly 5-lobed. Anthers obtuse and entire at the base. Style-branches more or less flattened, their appendages short, mostly rounded or obtuse. Achenes flattened, usually 2-nerved. Pappus-bristles fragile, slender, scabrous or denticulate, in 1-series or often an additional outer short series.

1. **E. foliosus** Nutt. Trans. Am. Phil. Soc. 2, 7:309 (1841).

Plant 3-6 dm. high; stems many from an herbaceous perennial base, erect, simple up to the open cymose inflorescence; herbage roughened with short rigid pustulate incurved hairs, especially on the leaves, or nearly glabrous; leaves rigid, very fragile when dry, linear, 1.5-4 cm. long, 2-4 or 6 mm. wide, only the upper ones reduced; involucre strigose-pubescent; rays about 30-40, violet or purple, 6-8 mm. long; achenes linear-oblong, the margins thickened, pubescent with spreading setiform hairs; pappus apparently simple but usually with a few short inconspicuous outer bristles.

Open, dry situations up to 1,000 ft. alt. May to October. Vicinity of Avalon and Pebble Beach, *Lyon* (Gray; Field); *Brandege*; *Eastwood* 6498; *Pendleton* 1410; *Reed* 2843; *Nuttall* 196, 359, 576, 709, 1208; *Knopf* 155.

There are many races of this species which includes *Erigeron stenophyllus* Nutt. FLEABANE.

6. LEPTILON Raf.

Annual or biennial herbs with small racemose thyrsoid or paniced heads of white flowers; rays small, usually shorter than the diameter of the disk, or none. Involucre mostly campanulate its narrow bracts in 2 or 3 series. Receptacle naked. Ray-flowers pistillate; disk-flowers perfect, their corollas usually 4-lobed or 4-toothed, the anthers obtuse at the base; style-branches somewhat flattened, their appendages short. Achenes flattened. Pappus of numerous, simple, fragile bristles in 1 series.

Involucre glabrous
Involucre pubescent.

1. canadense
2. linifolium.

1. **L. canadense** (L.) Britton, Brit. & Br. Ill. Fl. 3:391 (1898).
Erigeron canadensis Linn. Sp. Pl. 863 (1753).

Stem simple, erect, 6-25 dm. high; herbage hispid with scattered hairs or nearly glabrous; leaves linear to lanceolate the lowest spatulate

or narrowed to the petiole, 5-7 or 8 cm. long, mostly entire but the lower often acutely toothed or lobed; heads small, very numerous in a sometimes dense terminal panicle; involucre 4 mm. high, either perfectly glabrous or the outer bracts sparsely pubescent; ray-flowers numerous, their ligules white, shorter than or scarcely exceeding the pappus; pappus simple.

A weed of waste places. January to October. *McClatchie*; vicinity of Avalon, *Millsp.* 4508, *Nuttall* 767, 990. HORSEWEED.

2. **L. linifolium** (Willd.) Small Fl. SE. U. S. 1231, 1340 (1903).
Erigeron linifolius Willd. Sp. 3:1955 (1810).

Rather strict, 2-7 dm. high from an annual or biennial root; herbage somewhat hispid, also scabrous with a minute appressed pubescence; leaves narrowly spatulate to linear, 3-10 cm. long (the upper gradually shorter), all but the lower entire; heads rather few, in a loose panicle; involucre 4-5 mm. high; its bracts linear-subulate, all copiously pubescent; ligules very small, shorter than the style and the pappus, white; pappus simple, sordid and becoming ferruginous.

In moister situations than the last. March to October. Hillside bluff Cherry Valley, *Millsp.* 4826; old field at Isthmus, *Nuttall* 815.

7. ISOCOMA Nutt.

Somewhat woody plants with elongated rigid stems and thickish closely sessile leaves. Herbage never resinous-punctate. Heads rayless, collected into glomerules which are either terminal on short lateral branchlets or disposed in a terminal cymose cluster. Involucral bracts coriaceous, closely imbricated, the tips herbaceous but appressed. Flowers permanently yellow. Corolla-tube slender, the throat ventricose or obliquely dilated, its segments erect or more or less connivent about the style. Style appendages subulate-lanceolate or broader. Achenes longitudinally striate or ribbed, silky-pubescent or hirsute. Pappus of numerous sordid bristles, the innermost longest and often distinctly flattened.

1. **I. vernonioides** Nutt. Trans. Am. Phil. Soc. 2, 7:320 (1841).
Isocoma veneta vernonioides Jeps. Fl. W. Mid. Calif. 560 (1901).

Plant 4-12 dm. high, half woody at the branched base above which the stems are commonly simple up to the cymose or paniculate inflorescence; herbage from minutely scabrous to villous-arachnoid, rarely glabrous; leaves oblanceolate, spatulate, or cuneate-oblong, 1-3 cm. long or the lower twice this length and the numerous fascicled ones much shorter, acutely toothed or the upper narrow ones often entire; involucre narrowly to broadly turbinate, 7 or 8 mm. high, 15-35-flowered, its bracts with distinct green tips, commonly granulose on the

back and with ciliate or erose white margins, varying from obtuse to acute and cuspidate in the same head, sometimes bearing an indistinct resinous gland; achenes linear turbinate.

Common in open situations on dry soil. January to October. The *Bigelovia veneta* of Brandegee and Lyon lists. *Smith* 5163; *Mills* 4478, 4547, 4615, 4776; *Nuttall* 259, 760, 796, 840; *Eastwood* 6491; *Pendleton* 1377; *McClatchie* (N. Y., Field).

A very variable species that has been published in many varieties and forms the characters of which intergrade showing mere races; these include Greene's *Isocoma microdonta*, *latifolia*, *villosa*, *sedoides* and *decumbens*.

8. HAZARDIA Greene.

Shrubs or suffrutescent plants with brittle ascending stems. Herbage tomentose, or glandular, or quite glabrous, never resinous punctate. Leaves alternate, coriaceous, entire to spinulose-serrate. Heads chiefly paniculate, 20-40-flowered, turbinate or broader, arranged in spikes, racemes or panicles. Involucral bracts numerous, closely imbricated. Rays yellow, changing to purple, or wanting. Disk corollas yellow, changing to brownish-purple. Style-appendages very slender, almost terete, minutely pubescent but neither comose nor with a bearded tuft at the summit. Achenes linear, 4-6-nerved. Pappus reddish.

1. *H. squarrosa* (H. & A.) Greene, *Eryth.* 2:112 (1894).

Haplopappus squarrosus H. & A., *Bot. Beech.* 146 (1833).

Suffruticose at base, 6-10 dm. high, the erect stems somewhat branching and leafy; herbage finely pubescent and somewhat glutinous; leaves oblanceolate to obovate, obtuse but the strong midrib usually ending in a sharp point, somewhat clasping at the closely sessile base, sharply serrate; heads racemose or paniculate, often 2 or 3 together in a close cluster; involucre turbinate, 10-12 mm. high; bracts imbricated in many series, the acutish tips of at least the outer ones recurved or squarrose-spreading; rays none; achenes glabrous or sparsely pubescent.

Dry hillsides. March to October. Vicinity of Avalon, *McClatchie* (N. Y., Field); *Trask* (N. Y., Field); *Nuttall* 791, *Knopf* 192, 225; Wells Beach Canyon, *Mills* 4829.

9. BACCHARIS Linn.

Perennials, mostly shrubs but some herbaceous from a woody base, commonly resinous or glutinous, rarely pubescent. Leaves alternate. Heads many-flowered. Involucre imbricated. Flowers whitish or yellowish, dioecious. Staminate flowers with tubular corolla slightly dilated at the throat, the limb cleft into 5 linear lobes; ovary abortive,

style present. Corolla of the pistillate flowers very slender and thread-like, obscurely toothed at the apex, the teeth erect, not spreading. Pappus in the sterile plant of scanty capillary bristles; in the fertile copious and often very long.

Evergreen shrubs:

Leaves cuneate-obovate, up to 2-cm. long

1. *pilularis*

Leaves willow-like, up to 10-cm. long

2. *viminea*

Herbaceous perennials:

Leaves lanceolate, glabrous

3. *Douglasii*

1. **B. pilularis** DC. Prodr. 5:407 (1836).

Baccharis consanguinea DC. Prodr. 5:408 (1836).

A compactly branched shrub, 1-3 m. high or much lower and sometimes prostrate when growing near the sea; branchlets angular; leaves sessile, cuneate-obovate, very obtuse, 1 or 2 cm. long, coarsely or sinuately few-toothed or occasionally entire; heads solitary or several in the axils or in terminal clusters on the numerous leafy branchlets, short-cylindric or ovoid; involucre 4 mm. high, the outer bracts broadly, the inner narrowly oblong sometimes denticulate at the apex; achenes 10-nerved; pappus of the fertile flowers abundant, becoming 10 mm. long, that of the staminate flowers dilated at the apex.

Dry situations near the coast. May to October. *Brandegee* and *Lyon* lists; *Mrs. Trask*, September, 1897 (U. S., Field).

2. **B. viminea** DC. Prodr. 5:400 (1836).

Baccharis caerulescens DC. loc. cit. 402.

Distinctly shrubby and willow-like with strict, slender, woody stems 2-4 m. high, very leafy and producing very numerous short, lateral, flowering branches, striate angled; herbage scarcely glutinous; leaves narrowly lanceolate, acute at each end, entire or sparingly denticulate, 3-10 cm. long, inconspicuously or not at all 3-nerved; heads rather numerous in terminal and lateral cymes; involucre 5 mm. high; bracts chartaceous, oblong or the outer ones ovate, destitute of greenish center, with scarious margins, erose and mostly villous-ciliate; receptacle flat; pappus of fertile flowers apparently smooth but minutely scabrous under the microscope.

Low, damp places and along streams. January to October. Avalon Valley. *Brandegee*; *Millsp.* 4507; *Nuttall* 146, 567, 722; *Trask* (N. Y.; U. S.; Field); *Knopf* 64. MULE-FAT, GUATEMOTA.

3. **B. Douglasii** DC. Prodr. 5:400 (1836).

Herbaceous nearly or quite to the base, 18 dm. or less high; stems simple up to the terminal cyme or with a few simple ascending branches; herbage very glutinous; leaves lanceolate, attenuate above tapering below to a short petiole, 3-nerved from the base, 6-12 cm. long, the upper reduced, serrulate or entire; heads numerous in a terminal compound almost naked cyme; involucre bracts linear or lanceolate-

linear with greenish center, the scarious margins erose-ciliate; receptacle broadly conical; achenes 5-nerved, pubescent; pappus of fertile flowers short and soft, of the sterile ones clavellate at summit.

In damp places in canyon rills. January to October. *Brandegee*; *Trask*; *McClatchie* (N. Y., Field); creek bed east of Little Harbor and same location in Cottonwood Canyon, *Nuttall* 759, 853; Middle Ranch, *Mills* sp. 4604; *Knopf* 266. MULE-FAT; GUATEMOTE.

10. CONYZA Linn.

Herbs, or rarely shrubs with alternate leaves and rather small heads mostly in cymes or racemes. Bracts of the involucre in two or more rows, often with membranaceous margins. Receptacle naked. Pistillate flowers in two or more outer circles; their corollas slender, dull white or yellowish, much shorter than the style, with notched or obscurely ligulate border. Perfect flowers central, mostly fertile. Achenes small, compressed. Pappus usually a single series of bristles.

1. *C. Coulteri* Gray, Proc. Am. Acad. 7:355 (1868).

Stems 2-10 dm. high, erect from an annual root, herbaceous and leafy throughout, branching above into an oblong panicle of numerous heads; herbage viscidly pubescent or short-hirsute with many-jointed hairs; leaves thin, the lower oblanceolate in outline (often 1 dm. long), the main cauline varying to narrowly oblong and closely sessile by a broad base (2-5 cm. long), all thin and coarsely toothed; involucre 3 mm. (whole head about 5 mm.) high; bracts linear-acuminate, the inner ones scarious, the outer obscurely white-margined; pistillate flowers numerous, their nearly white corollas only one-half as long as the style and with obscurely toothed summit; perfect flowers 5-8; achenes elliptic-oblong, minutely pubescent; pappus dull white, soft, much exceeding the involucre.

Moist or rich soil. January to August. Vicinity of Avalon, *McClatchie* (N. Y., Field); ascending to nearly 2-m. at Middle Ranch, *Mills* sp. 4602.

Tribe 3. ANTHEMIDEAE—Mostly strong-scented or aromatic plants. Leaves alternate, all or some of them finely dissected, pinnately parted, or pinnatifid, except in a few species. Bracts of the involucre imbricated, commonly dry and scarious or with scarious margins. Receptacle naked, or pubescent, or with chaff-like bracts. Flowers white, yellow or greenish, either all perfect or the outer ones pistillate or neutral. Rays present or none. Anthers not caudate. Style-branches of pistillate flowers obtuse or truncate, destitute of appendage. Pappus none or a short scarious crown.

Receptacle chaffy:

Heads solitary, rays 10-20

Heads cymose, rays 4-6

Receptacle naked:

Heads in paniced racemes or spikes

11. MARUTA

12. ACHILLEA

13. ARTEMISIA.

Heads peduncled:

Small, achenes pedicelled
Large, achenes not pedicelled

14. COTULA
15. CHRYSANTHEMUM

11. MARUTA Cass.

Aromatic branching herbs with alternate never entire leaves. Heads solitary on terminal peduncles. Ray-flowers white or yellow; disk-flowers yellow. Involucre hemispheric. Receptacle conical, chaffy toward the summit. Achenes not flattened, glabrous. Pappus none.

1. **M. Cotula** (L.) DC. Prodr. 6: 13 (1837).
Anthemis Cotula Linn. Sp. Pl. 894 (1753).

Annual, 2-6 dm. high, nearly glabrous; leaves mostly sessile, finely and pinnately dissected into linear acute lobes; involucre about 7 mm. broad, shorter than the disk, its bracts imbricated in several series; rays 10-20, white, 8-10 mm. long, at length reflexed; chaff of the receptacle narrow and acute or bristle-like; achene rugose, 10-ribbed.

Waste places. June to October. *Brandegge* says: Zoe 1:114, "One of the recent introductions by way of Avalon where it is very large and abundant" (1889); *Dr. Davidson* says: Eryth. 1:60, "It covers quite a large area at Avalon" (1893). *Knopf* finds it (114) near the Wireless Station on Pebble Beach road, May 15, 1921; on Avalon Hill; and along the Foot Trail to Summit. GOOSEWEED. MAYWEED.

12. ACHILLEA Linn.

Ours an erect strongly scented perennial herb with finely dissected alternate leaves. Heads radiate, corymbose at the ends of the stem and branches. Ray-flowers few, pistillate, fertile. Involucral bracts appressed, imbricated in few series, the outer shorter. Receptacle nearly flat, the chaff membranous and subtending fertile disk-flowers. Achenes linear, or oblong to obovate, obcompressed. Pappus none.

1. **A. lanulosa** Nutt. Jour. Acad. Phila. 7: 36 (1834).

A perennial, with a creeping rootstock; stem 3-5 dm. high, more or less densely villous, simple, striate; leaves 5-10 cm. long, rarely more than 1 cm. wide, the lower oblanceolate in outline and petioled, the upper sessile and clasping, linear in outline; primary divisions lanceolate in outline, ascending, crowded, the ultimate ones linear, spinulose-mucronate; rachis scarcely margined; heads in flat-topped corymbiform panicles; involucre campanulate, 4-4.5 mm. high, 3-4 mm. broad, villous; bracts about 20, in 4 series, the outer lance-ovate, obtusish, the inner elliptic or oblong, obtuse, margins light-brown; ray-flowers commonly 5; ligules white, 2.5-3.5 mm. long, nearly orbicular,

round-lobed; disk-flowers about 20; corollas 2.5 mm. long, yellowish-white; achenes 2 mm. long, with thick margins.

A weed in waste places and fallow fields. January to October. *Lyon: Brandegee* (as *A. millefolium*); *Macbride and Payson*; dry fields at the Isthmus, *Mills* sp. 4617; upper Pebble Beach Road, *Knopf* 16, 81. YARROW, MIL-FOIL.

13. ARTEMISIA Linn.

Herbs or shrubby plants, mostly bitter and aromatic, with alternate leaves. Heads small, discoid, nodding or erect, in paniced spikes or racemes. Flowers yellow or purplish, all tubular; disk-flowers perfect and marginal ones pistillate, or all perfect. Corolla of the pistillate flowers 2 or 3-toothed, of the perfect flowers 5-toothed. Involucre imbricated, dry and scarious. Receptacle nearly flat to hemispheric, naked in all our species (except *A. Palmeri*). Achenes commonly oblong or obovoid and glabrous, with a small terminal areola. Pappus none.

Leaves linear:

Herbage glabrous

Herbage canescent at least beneath

Leaves broad:

Glabrous or nearly so

White-tomentose beneath

1. *dracunculoides*

2. *californica*

3. *vulgaris*

4. *heterophylla*

1. *A. dracunculoides* Pursh, Fl. 2:742 (1814).

Plants 6-12 dm. high: stems not woody, either virgately or paniculately branched above: herbage glabrous, strong-scented; leaves linear, 2-10 cm. long, 2-4 mm. wide, entire or the lowermost 3-toothed or -cleft; heads numerous, on very slender short peduncles in a close or open panicle, the clusters sometimes secund on the slender branches; involucre nearly hemispheric, 2 or 3 mm. high; receptacle hemispheric.

Dry, open situations. July to October. *Trask* (U. S.; Field); Beacon Street Canyon, Avalon, Aug. 10, 1920, *Nuttall* 786.

2. *A. californica* Less. Linnæa, 6:523 (1831).

Gray shrub, 6-12 dm. high; herbage aromatic, clothed in a minute appressed pubescence, varying to green and nearly glabrous; leaves once or twice parted into linear-filiform segments, or the upper ones entire and more or less fascicled; heads many, in long racemose panicles, nodding; involucre hemispheric, 2 to 3 mm. high; achenes with a minute squamellate crown.

Dry open hillsides. July to November. *Brandegee*; *Mrs. Trask* (U. S.; Field); *Lyon*; *Reed* 2810, 2811; Pebble Beach Road, *Pendleton* 1373, 1374; Pebble Beach Canyon and Middle Ranch, *Nuttall* 835, 893, 992, *Knopf* 42.

Mrs. Trask records individuals of the species 30-36 dm. high with a trunk 1.5 dm. in diameter. HILL-BRUSH. SAGEBRUSH.

3. **A. vulgaris** Linn. Sp. Pl. 848 (1753).

Perennial; stem glabrous or nearly so, much branched, 3-4.5 dm. high. Leaves 2.5-11.5 cm. long, deeply pinnatifid linear, oblong, or somewhat spatulate, pinnatifid, toothed or entire lobes, densely white-tomentose beneath, dark green and glabrous above, the lower petioled and often with 1 or 2 pairs of small lateral divisions at or near the base of the petiole, the upper sessile, the uppermost sometimes linear and entire; heads numerous, erect, about 4 mm. broad, in panicked, simple or compound spikes; involucre oblong-campanulate, bracts oblong, obtusish, scarious-margined, tomentose or glabrous, receptacle naked; central flowers fertile.

A weed in waste places. June to October. *Brandegee* reported as *Artemisia ludoviciana*. MUGWORT. WORMWOOD.

4. **A. heterophylla** Nutt. Trans. Am. Philos. Soc. 2, 7:400 (1841).

Stems erect, woody at base, strict, 6-16 dm. high; leaves 4-10 cm. long, lanceolate to broadly oblong or elliptic, sparingly pinnatifid (with downward incisions), cleft, or often entire (especially the upper), green above white-tomentose beneath; heads mostly erect, the spikes in an open or more or less commonly dense terminal panicle, the main axis leafy below and bracteate above; involucre ovoid, 12-25-flowered, 3 or 4 mm. high, permanently arachnoid.

Moist situations. July to October. Common along the creek in Middle Ranch Canyon and at Middle Ranch above the buildings, *Nuttall* 659, 894. The plants were from 1-3 m. high; the panicles sometimes 0.5 m. long; and the largest leaves 15 x 7 dm.

14. **COTULA** Linn.

Low herbs with mostly alternate leaves. Flowers yellow. Heads slender-peduncled, discoid, low-hemispheric. Bracts of the involucre greenish, nearly equal, in 1 or 2 ranks. Receptacle flat or nearly so, naked. Outer series of flowers pistillate only. Disk-flowers with 4-toothed corolla, perfect, fertile or infertile. Mature achenes raised on pedicels, in our species compressed and spongy-margined or narrowly winged. Pappus none.

Annual; pistillate flowers in 2 or 3 rows
Perennial; pistillate flowers in 1 row

1. *australis*
2. *coronopifolia*

1. **C. australis** (Sieb.) Hook. f. Fl. Nov. Zeal. 128 (1853).

Anacyclus australis Sieb. Spr. Syst. 3:497 (1825-8).

Plants 0.5-2 dm. high, with slender branching stems; herbage not succulent, sparsely pubescent with soft spreading hairs; leaves once or twice pinnately dissected into linear lobes; heads 2-5 mm. broad; bracts of the involucre brownish-tipped with scarious edges; pistillate flowers in 2 or 3 rows, pediceled, apetalous; disk-flowers nearly or quite sessile:

achenes somewhat compressed, minutely hispid on both faces but the margin glabrous.

A street waif adventive from Australia. March to June. Very plentiful in large areas on several town lots in the center of Avalon, *Mills* sp. 4729.

2. *C. coronopifolia* Linn. Sp. Pl. 892 (1753).

Herbaceous perennial, often subaquatic and then rooting from the lower nodes; herbage somewhat succulent, glabrous; stems commonly many and clustered, decumbent or ascending, 1-4 dm. long; leaves linear, lanceolate, or oblong, entire to coarsely toothed or pinnatifid on the same plant, dilated at base into a short sheath around the stem; heads depressed, 8-10 mm. broad; pistillate flowers in a single row, their pedicels becoming one-half as long as the involucre, without corolla; disk-flowers on much shorter pedicels.

In moist situations or actually subaquatic. May to August. *Trask* (N. Y., Field); *Brandege*; *Lyon*; mouth of Cottonwood Canyon, June 11, 1922, *Knopf* 466.

15. **CHRYSANTHEMUM** [Tourn.] Linn.

Perennial or annual mostly erect and branching herbs with alternate, dentate, incised, or dissected leaves and large, usually long-peduncled heads of both tubular and radiate flowers, or rays rarely wanting. Involucre hemispheric or depressed, its bracts appressed, imbricated in several series, the outer shorter. Receptacle flat, convex or hemispheric, naked. Ray-flowers pistillate, fertile, the rays white, yellow or rose-colored, entire or toothed. Disk-flowers perfect, fertile, their corollas with terete or 2-winged tubes and 4-5-cleft limbs. Anthers obtuse and entire at the base. Style-branches of the disk-flowers truncate, pectillate. Achenes angled or terete, 5-10-ribbed, those of the ray-flowers commonly 3-angled. Pappus none or a scaly cup.

Herbaceous; rays yellow, erose
Fruticose; rays white, entire

1. *coronarium*
2. *frutescens*

1. *C. coronarium* Linn. Sp. Pl. 890 (1753).

Herbaceous, glabrous; stem erect, diffusely branched; leaves partly clasping at base, bipinnatifid, lobes lanceolate dilated at apex, incised serrate; branches nude at summit, 1-headed; involucre campanulate, bracts all scarious at apex; achenes obscurely trigonal, convex and striate on the dorsum, lateral angles scarcely exerted the median angle produced into a small wing with a dentiform apex.

A Mediterranean species formerly only known in North America from Ontario. May to July. In a grain field above the saw-mill in Avalon Valley. *Nuttall* 134.

2. **C. frutescens** Linn. Sp. Pl. 1251 (1753).

Fruticose, always glabrous; leaves fleshy, pinnatipartite, lobes small, linear, dentate, the upper divisions three, setose; flowering branches nude at the prolonged summit, single headed; achenes with narrowly winged angles.

A Canary Island species not before reported as an established escape on this continent. March to August. Fully established in ditches and on roadsides at Avalon, *Mills*. 4728.

Tribe 4. **HELENEÆ** — Herbs, or a few species suffruticose. Leaves alternate or opposite, in one subtribe punctate with oil-glands. Heads radiate or discoid. Involucral bracts mostly in one to three series, herbaceous or in a few genera with membranous margins. Receptacle not paleaceous, yet sometimes bristly or hairy. Anthers not caudate. Pappus of paleæ, awns, or bristles, or often wanting.

Leaves all opposite:

Involucral bracts unequal

16. **COINOGYNE**

Involucral bracts equal

17. **BAERIA**

Leaves alternate, at least above:

Heads discoid

18. **AMBLYOPAPPUS**

Heads radiate:

Rays white (or never yellow)

19. **PERITYLE**

Rays yellow, herbage white-woolly

20. **ERIOPHYLLUM**

herbage never woolly

21. **HELENIUM**

16. **COINOGYNE** Less.

Perennial glabrous herbs. Leaves linear, entire, opposite, connate in pairs at base. Heads medium-sized, many flowered, solitary, terminating the branches. Flowers yellow, the rays pistillate, all fertile. Involucre cylindraceous-campanulate, its bracts broad and imbricated, the outermost short. Receptacle naked, conical. Corolla grabrous. Style-branches of the disk-flowers thickened upward and papillose. Achenes linear, striately 10-nerved.

1. **C. carnosa** Less. Linnæa 6: 521 (1831).

Jaumea carnosa Gray, Wilkes. Exped. 17: 360 (1874).

Stems rather slender, many from the fleshy crown of the tap-root, mostly simple, 1-2 or 3 dm. long, decumbent at base and rooting at the nodes; herbage succulent; leaves semi-terete, about 2.5 (1.5-5) cm. long; involucre 1 cm. high; rays mostly 5-10, not longer than the convex disk; achenes glabrous; pappus none.

Saline mud of inlets. July to January. *Trask* (N. Y., Field); *Brandegee*; muddy bottom at Ballast Point, Catalina Harbor, *Pendleton* 1429, *Reed* 2853. *Mills*. 4613, *Nuttall* 803.

17. **BÆRIA** Fisch. & Mey.

Ours low and mostly slender annuals. Herbage commonly pubescent and often glutinous but never hoary. Leaves opposite, linear.

entire or lacinate-pinnatifid. Flowers yellow, the heads on slender peduncles. Involucre campanulate or hemispheric, its bracts as many as the rays, ovate or oblong and becoming more or less carinate below the middle in most species. Receptacle from hemispheric to subulate, usually conical. Ray-flowers mostly 5-18, pistillate, showy in comparison to the size of the heads, or the ligules sometimes very short. Disk-flowers hermaphrodite, their style-branches obtuse and either with or without a minute appendage. Achenes linear but somewhat broadened upward. Pappus of paleæ, or awns, or both or none.

1. **B. chrysostoma** Fisch. & Mey. Ind. Sem. Hort. Petrop. 2:29 (1835).

Plant low and with unbranched stems when growing in especially poor soil; becoming robust, profusely branched, and 10-25 cm. high under favorable conditions; herbage strigulose to hirsute; leaves narrowly linear, 3 mm. or less wide, entire; involucre broad, 3-6 mm. high; bracts 10-15 (or even 18) or in depauperate plants 5-10; ray-flowers as many as the bracts; ligules 3-8 mm. long; style-tips capitate and seldom, if ever, with a minute apiculation; achenes in the typical form linear-clavate, slightly rounded at summit, either perfectly smooth and shining or with minute rounded papillæ: Pappus in the typical form none(?).

Dry hillsides and sandy levels. March to July. *Gambel*; *Trask* (N. Y., Field); *Brandege*; *Lyon* (Gray; Field); all as *Baeria Palmeri clementina*; *Brandege* (as *Baeria gracilis*); *Smith* 4995, 5027; *Millsp.* 4780; *Nuttall* 3, 241; *Moxley* 748; *Knopf* 47, 126; Cottonwood Canyon, *Knopf* 396. GOLD FIELDS, SUNSHINE, GOLDEN MONTH.

We are entirely unable to find characters in any of the Catalina or mainland specimens upon which a consistent variety could be based; while the races are so many, and the characters so interspersed, that even forms cannot be designated unless each individual plant is given a form name.

18. **AMBLYOPAPPUS** Hook. & Arn.

Low annual with gummy, sweet-scented herbage. Heads small, discoid, in loose elongated cymes and racemes terminating the simple erect stems. Involucral bracts 4-6, rather broad, ovate-oblong. Receptacle small, conical. Achenes small, 4-angled, narrowed below. Pappus of 8-12 oblong obtuse paleæ, often colored.

1. **A. pusillus** Hook. & Arn. Jour. Bot. 3:321 (1841).

Aromia tenuifolia Nutt. Trans. Am. Philos. Soc. 2, 7:396 (1841).

Plant about 2 (rarely 5) dm. high; leaves alternate, linear, entire or the lower pinnately 3-5-parted and somewhat opposite; involucre 3 mm. high; flowers 5-25, yellowish.

Dry bluffs near the sea. June to August. *Trask* (N. Y.; Field); *McClatchie* (N. Y.; Field); *Brandege*; *Lyon*; Pebble Beach Road, and bluffs at the Isthmus, *Reed* 2812, 2851; *Pendleton* 1432, 1376; *Nuttall* 257. COQUIMBO.

19. PERITYLE Benth.

Annual or biennial herbs. Herbage glabrous or viscid-pubescent, never white-woolly. Leaves petiolate, the upper alternate, the lower often opposite. Heads numerous, on evident peduncles, many-flowered. Involucral bracts in a single series, the margins overlapping, faintly keeled externally, shallowly grooved on the inner surface the groove being occupied by the outer edge of the ray-achene. Disk-flowers numerous, yellow, 4-toothed. Rays short, white or yellow. Achenes flat with ciliate or cartilaginous margins. Pappus a squamellate or cupulate crown and often a slender awn from one or both of the angles.

1. *P. Emoryi* Torr. Emory's Rep. N. Mex. 142 (1848).

Plant 3-6 dm. high, with striate stems freely branching and widely spreading from an annual or more enduring root; herbage viscid and glandular-pubescent throughout and also somewhat short-hirsute or glabrate below, ill-scented; leaves roundish or cordate in outline, incisely 5-8-lobed or -cleft, the divisions acutely few-toothed; lower leaves 1.2 cm. long, on petioles of equal length; upper smaller, often nearly sessile; peduncles 1-4 cm. long; heads 7 mm. high; outer involucral bracts oblong, acute, ciliate; inner bracts narrower, scarious-margined; rays about 12, 2 or 3 mm. long; all the corollas glandular-pubescent; style-branches with short minutely hirsute appendages; achenes flat, oblong to subclavate, black, smooth and shining or rarely puberulent on the sides, hispid-ciliate on the margins; pappus an inconspicuous erose or lacerate crown and a single slender awn about as long as the achene, or the awn usually wanting.

Dry bluffs and hillsides. July to October. *Trask* (N. Y., Field); *Macbride* and *Payson* 858; *Chamberlain*; *Brandege*; *Davidson*; Pebble Beach Road, *Smith* 5049, 5052; *Reed* 2805; *Pendleton* 1378; *Nuttall* 573; *Knopf* 165; Cottonwood Canyon, *Nuttall* 856; Silver Canyon, *Nuttall* 750.

20. ERIOPHYLLUM Lag.

Annual and perennial herbs or suffruticose plants. Herbage white-woolly, at least when young. Leaves (in our species) variously toothed, divided or incised. Involucre oblong to hemispheric, its bracts distinctly rigid and permanently erect, concave and disposed to enfold the mature outer achenes. Receptacle flat or convex. Rays 4-13 or 15, broad, rarely wanting. Tube of disk-corollas commonly glandular and

hairy. Style-branches from truncate to conical or subulate. Achenes linear or linear-clavate. Pappus various, sometimes wanting.

Rays 6-10; leaves 15-cm. or more
Rays 4 or 5; leaves 3-cm. or less

1. Nevinii
2. confertiflorum

1. *E. Nevinii* Gray, Syn. Fl. 1, 2:452 (1886).

Decidedly woody below, about 10 dm. high; leaves 15 cm. or more long, ovate in outline, once or twice pinnately parted into numerous oblong obtuse lobes, equally white-tomentose on both sides; tomentum of the stems deciduous; heads numerous, crowded in naked-pedunculate, broad, flat-topped, compound cymes; involucre cylindrical, 6-7 mm. high; bracts oblong, obtuse, rather loose; rays 7-10, short, yellow; pappus of 4-6 erose paleae, often unequal, the longer ones lanceolate and acute.

Conspicuous on rocky sea bluffs. April to October. *Mrs. Trask* (U. S.; Field); *Brandegge*; (Gray, Field); vicinity of Avalon, *Reed* 2806; *Pendleton* 1381, 1382; *Eastwood* 6448 (F. G.); *Millsp.* 4825, 4896; *Knopf* 264. A form with finely divided leaves and blunter bracts is now and then collected—Cliffs near Sugar Loaf, *Nuttall* 641, *Knopf* 151. DUSTY MILLER.

2. *E. confertiflorum* (DC.) Gray, Proc. Am. Acad. 19:25 (1883).
Bahia confertiflora DC. Prodr. 5:657 (1836).

Plants 2-6 dm. high; stem slightly woody at base, often unbranched; herbage with a close, dense (at length deciduous) tomentum; leaves of the flowering branches 3 cm. or less long, ternately or pinnately parted into 3-7 narrowly linear divisions; heads in compact terminal clusters; involucre obovoid-oblong, 4 mm. high; its bracts about 5, ovate; rays 4 or 5, yellow, about 4 mm. long; paleae 8-10, nearly equal, about half as long as the achene.

Dry sea bluffs. The year around. *Mrs. Trask* (U. S.; Field); *Brandegge*; Our specimens all from sea bluffs in the vicinity of Avalon, *Smith* 5040; *Millsp.* 4685, 4759; *Pendleton* 1361; *Moxley* 735; *Nuttall* 75, 568; *Knopf* 55.

21. HELENIUM Linn.

Erect herbs, ours perennial and with resinous-dotted foliage. Leaves alternate, sessile except the lower, often decurrent on the stem. Heads solitary or cymose, borne on long naked peduncles. Flowers yellow, or the lobes of the disk-corolla turning yellowish or brownish, either all perfect or the ray-flowers pistillate or neutral. Rays several, usually drooping. Bracts of the involucre linear, reflexed. Receptacle globose or hemispheric, naked. Achenes turbinate, ribbed. Pappus of 5-12 thin or hyaline paleae, in ours short-pointed.

1. *H. puberulum* DC. Prodr. 5:667 (1836).
Heleniastrum puberulum Ktze. Rev. Gen. 1:342 (1891).

Paniculately branched, 6-15 dm. high, the branches ending in long, slender peduncles; herbage puberulent and resin-dotted; basal leaves oblanceolate, usually sinuate-margined; cauline leaves lanceolate, oblong, or the upper ones linear, entire, sessile and strongly decurrent on the stem; disk 10-15 mm. broad; rays reflexed, short and inconspicuous; disk flowers red-brown; Pappus-paleae ovate, short-awned.

Wet situations. May to August. *Davidson*; *Trask* (N. Y., Field). In the creek-bed of the canyon above Chicken Johnny's, *Nuttall* 270. SNEEZEWEED. ROSILLA.

Tribe 5. *SENECIONIDEÆ*—Herbs and shrubs or a few species arborescent. Leaves mostly alternate or radical (opposite in *Arnica*). Heads either discoid or radiate. Involucre mostly of a single series of similar bracts, sometimes with an outer calyculate series, rarely imbricated in several series. Receptacle nearly always naked. Anthers mostly rounded at base. Style-branches of hermaphrodite flowers usually flat, the truncate tips pencillate and the stigmatic lines (which are near the margins) not meeting. Pappus of numerous fine bristles, rarely subpaleaceous.

22. *SENECIO* Linn.

Herbs or woody plants with alternate leaves and with heads in terminal cymes or rarely solitary. Heads many-flowered, radiate or discoid. Flowers in our species yellow. Involucre cylindrical to campanulate, mostly with 1 or 2 rows of outer erect bracteoles at base, these elongated and exceeding the proper involucre in a few non-Californian species. Receptacle flat, naked. Anthers mostly rounded at base. Style-branches truncate. Achenes terete. Pappus of abundant white and soft bristles.

Involucre copiously bracteolate; leaf-lobes acute	1. <i>Douglasii</i>
Involucre sparingly bracteolate; leaf-lobes obtuse	2. <i>Lyonii</i>

1. *S. Douglasii* DC., Prodr. 6:429 (1837).

Stems branching from the suffrutescent base and forming a bushy plant usually 1-1.5 m. high, leafy up to the inflorescence; herbage at first whitish-tomentose, later more or less glabrate; lower leaves more or less pinnately divided into 5-9 narrowly linear revolute lobes, the upper with only 3 lobes (the middle one several times larger), or the uppermost entire; heads in broad terminal open cymes; involucre 8-10 mm. high, broadly turbinate, the bracts linear with attenuate tips, dorsally carinate below; rays about 13, the ligules about 10 mm. long; achenes linear, pubescent.

Common in washes and other gravelly places. July to October. Among the pebbles at Pebble Beach, *Nuttall* 287, 794.

2. **S. Lyoni**, Gray, Syn. Fl. I, 2:456 * (1886).

Somewhat suffrutescent at base, 1 m. or so high, freely branching and leafy throughout; herbage at first tomentose, soon glabrate except for persistent dense tufts of wool in the leaf-axils and often a sparse tomentum on the under side of the leaves; leaves once or twice pinnately parted into broadly linear obtuse segments and lobes, sessile by an auriculate base or petiolate and the petiole dilated at base; inflorescence loosely cymose, the peduncles bearing a few subulate bracts; involucre broadly turbinate, 7 or 8 mm. high; bracts linear, with acute pubescent tips, the medial line thickened and the margins scarious.

Dry, open hillsides. May to July. *Brandegee*; *Grant & Wheeler* (N. Y., Field); along Pebble Beach Road, *Smith* 5057; *Knopf* 353. GROUNDSEL.

Tribe 6. *HELIANTHÆ*—Herbs or shrubs with mostly yellow flowers, many with balsamic-resinous juice. Heads homogamous and discoid or heterogamous with pistillate or neutral ray-flowers and hermaphrodite disk-flowers, the latter either fertile or sterile. Receptacle with chaff-like bracts each subtending a flower. Anthers obtuse at base, not caudate. Pappus various or wanting but never of simple truly capillary bristles. Achenes thick or flattened contrary to the subtending chaffy bract, never parallel with it.

Outer bracts of involucre foliaceous, exceeding inner:

Disk achenes thick, 4-5-angled

23. *HELIANTHUS*

Disk achenes flat, 2-angled

24. *ENCELIA*

Outer bracts of involucre narrower than inner:

Inner bracts distinct

25. *COREOPSIS*

Inner bracts united into a cup

26. *THELESFERMA*

23. **HELIANTHUS** Linn.

Stout coarse herbs with rough leaves, yellow mostly entire rays and brownish purple or yellow disk. Leaves mostly alternate but the lower or lowest commonly opposite. Heads middle-sized or large, hemispheric, solitary on the ends of the branches or in terminal cymes. Bracts of the involucre imbricated. Receptacle flat or convex, its bracts persistent and embracing the achenes. Ray-flowers neutral. Achenes thick, slightly compressed, 4-sided or elliptic in cross section. Pappus of pointed paleae borne at the angles of the achene, often with very small intervening scales, all caducous.

1. **H. annuus** Linn., Sp. Pl. 904 (1753).

Erect and simple or more or less branching, 5-30 dm. high; herbage rough-hispid; leaves petiolate, deltoid-ovate, serrate, the uppermost narrow and often entire; bracts of the involucre ovate, slenderly acuminate, ciliate; bracts of the receptacle 3-cleft at apex, the middle lobe lanceolate and longer than the others; rays about 2 or 3 cm. long.

Waste grounds. May to September. On the far side of Reservoir Hill, *Nuttall 569*. SUNFLOWER.

24. **ENCELIA** Adans.

Herbs and low shrubs. Leaves 3-nerved from the base, entire or remotely toothed. Heads on nearly naked peduncles, ours with showy yellow rays and yellow or purple disk. Ray-flowers neutral. Disk-achenes flat, in our species obovate or cuneate and with conspicuously ciliate margins, the sides either smooth or pubescent in the same species. Pappus none, or of 1 or 2 slender awns in some species.

1. **E. californica** Nutt., Trans. Am. Philos. Soc. 2, 7:357 (1841).

Slender spreading stems 6-10 dm. high, shrubby only below, usually growing in clumps of considerable size; leaves ovate to lanceolate, acute, 2-6 cm. long, narrowed to the petiole, green, minutely scabrous or glabrate; heads solitary, terminating elongated nearly naked peduncles; involucre densely white-villous, 10-15 mm. high; rays 16-30, 1.5-3 cm. long; disk purple, .5-2.5 cm. broad; corolla lobes either smooth or pubescent.

Dry hillsides. Throughout the year. Vicinity of Avalon, *Dall & Baker (Gray)*; *Trask* (N. Y.; Field); *Lyon*; *Brandegee*; *Eastwood 6501*; *Smith 4987*; *Pendleton 1397*; *Millsp. 4527*; *Nuttall 20*; *Knopf 2, 78, 203, 263*. SUNFLOWER.

25. **COREOPSIS** Linn.

Mostly herbaceous plants, a few species shrubby. Heads medium-sized or large, long-peduncled, solitary or in loose cymes. Involucre double; bracts of the inner series 8-12, erect, membranous; bracts of the outer series 5-8, narrow, loose and foliaceous. Flowers both ray and disk yellow in our species and the ray-flowers either pistillate or neutral. Achenes flat to meniscoidal, linear-oblong to oval, the margins either smooth or ciliate or winged. Pappus none or of bristles, scales, or teeth proceeding from the angles of the achene.

1. **C. gigantea** (Kell.) Hall, Compos. So. Calif. 143 (1907). Plates IX & XIII.

Leptosyne gigantea Kell. Proc. Calif. Acad. 4:198 (1873).

Erect, robust, 3-12 or even 20 dm. high, trunk fleshy-woody often 1 dm. or more thick; primary branches distant, horizontal or ascending, leafy only towards the ends; leaf-divisions filiform, from very short to 5 cm. or more long, varying between these extremes from year to year on individual plants; heads medium-sized (disk about 2 cm. broad) on cymosely clustered peduncles 1.5 dm. or less long; outer involucre of oblong or lanceolate bracts; inner bracts longer, oblong, yellowish, the middle nerve prominent toward the base; rays 10-16, 2.5-3 cm. long; ring of disk-corollas beardless; achenes narrowly oblong, margined, glabrous; pappus none.

Rocky bluffs near the coast and generally well up the slopes. February to July. *Lyon*; *Trask* (N. Y., Field); *Brandegge*; sea cliff near Avalon, *Smith* 5034, *Nuttall* 571; *Grant & Wheeler* (N. Y., Field); *Knopf* 56. NIGGER HEAD, TURPENTINE WEED. The succulent leaves are relished by browsing animals and also have been utilized as a pot-herb. The species is almost entirely insular and is becoming rare where cattle or sheep are pastured. It is now found only on inaccessible cliffs though there is a large clump in a fenced-in field on the east hillside at the Isthmus. The most characteristic growth is on Bird Rock (*Mills* 4630, *Knopf* 258).

26. **THELESERMA** Less.

Perennial, sometimes annual or suffrutescent herbs, smooth and glabrous; with the habit of *Coreopsis*; opposite, usually finely dissected leaves and peduncled heads; rays normally golden-yellow; disk-flowers yellow, sometimes purplish or brownish.

1. **T. gracile** (Torr.) Gray, Hook. Jour. Bot. 1:252 (1849).

Bidens gracilis Torr. Ann. Lyc. N. Y. 2:215 (1828).

Rigid; 3-6 dm. high from a deep perennial root, branching, naked above; leaves once or twice 3-5-nately divided or parted into filiform-linear or broader lobes, or some upper ones filiform and entire; bracts of the outer involucre 4-6, very short, ovate or oblong; inner connate to above the middle, the edges of their lobes slightly scarious; disk mostly yellow, scarcely brownish after anthesis; achenes somewhat papillose or roughened, the bracts of the summit exceeded by the subulate awns; rays usually none, rarely pubescent, 4-5.5 mm. long.

Avalon Valley, along the road beyond the saw-mill, August 10, 1920, *Nuttall* 602; *Eastwood* 6526.

Tribe 7. **MADIEÆ**—Ours annual or biennial herbs (with the exception of one species of *Hemizonia*). Herbage often glandular or viscid or heavy-scented. Leaves alternate or oppo-

site. Bracts of the involucre in a single series, each partly or completely enclosing an achene. Bracts of the receptacle commonly in a single series between disk and ray and often united into a cup or sometimes scattered among the disk-flowers. Rays always present in our genera though sometimes inconspicuous. Anthers not caudate. Ray-achenes always fertile, seldom pappose; disk achenes either fertile or sterile, their pappus paleaceous, awn-like or wanting.

- | | |
|--|---------------------------|
| Ray-achenes laterally compressed | |
| Enclosing bract sulcate, strongly carinate | 27. <i>MADIA</i> |
| Ray-achenes commonly obcompressed | |
| Enclosing bract rounded on back: | |
| Achene half enclosed by the bract | 28. <i>HEMIZONIA</i> |
| Achene wholly enclosed by the bract: | |
| Pappus of 15-20 awns | 29. <i>BLEPHARIPAPPUS</i> |
| Pappus of 10 broad paleae | 30. <i>ACHYRACHAENA</i> |

27. *MADIA* Mol.

Erect annual and perennial herbs often glandular-viscid and heavy-scented. Leaves alternate (at least the upper), entire or serrate. Flowers yellow, opening in the evening and closing before noon of the next day. Involucre angled by the carinate or almost conduplicate bracts, these in one series, each completely enclosing its ray-achene with which it is deciduous, and with a free moderately long or a short tip. Receptacle flat or convex, its bracts in a single row between ray and disk-flowers and often united into a cup. Rays few to many, pistillate, the ligules 3-lobed. Disk-flowers 1 to many, perfect, but their achenes mostly abortive. Ray-achenes laterally compressed, oblique, with narrow backs, rarely beaked, Pappus, in our species, none.

- | | |
|------------------------------------|------------------------|
| Disk-flowers 5-20: | |
| Disk-achenes angular, plants stout | 1. <i>sativa</i> |
| Disk-achenes flat, plants slender | 2. <i>dissitiflora</i> |
| Disk-flower solitary | 3. <i>exigua</i> |

1. *M. sativa* Molina, Chile ed. 1: 136 (1782).

Usually robust, 3-6 dm. high; herbage pubescent with slender hairs and beset with pedicillate very viscid glands, ill-scented; leaves from broadly-lanceolate to linear; heads short-peduncled or sessile, disposed in the upper axils and in small clusters terminating short branches; involucre 8-12 mm. high; its bracts hispid; ray-flowers 5-12, with pale-yellow ligules about 4mm. long; cup of receptacle campanulate and enclosing many disk-achenes; achenes cuneate-oblong and somewhat 4-angled, prominently 1-nerved on each face; ray achenes somewhat falcate-obovate, either with or

without an obvious nerve on each side; receptacle either glabrous or minutely hirsute.

Dry open situations. May to August. *Lyon*; *Brandeggee*; along the Coach Road and in Descanso Canyon, *Nuttall* 572, 231. CHILE TAR-WEED.

2. ***M. dissitiflora* (Nutt.) T. & Gr. Fl. 2:405 (1843).**

Madorella dissitiflora Nutt. Trans. Am. Phil. Soc. 2. 7:387 (1841).

Very slender, 2-6 dm. high, simple or loosely branched; herbage pubescent but moderately if at all viscid, at least below; heads loosely racemose or more often paniculate, the peduncles seldom very short; involucre 5-8 mm. high; cup of receptacle ovoid but not closed, containing few disk-flowers; ray-flowers 5-8, the sulphur-yellow ligules 3 or 4 mm. long; disk-achenes short and broad, flat, not angled but with one or both of the faces more or less prominently 1-nerved; receptacle glabrous.

Grassy hillsides. May to August. Mountain above Pebble Beach and upper end Hamilton Canyon, *Nuttall* 581, 580, 61; near Summit, *Knopf* 129; Pebble Beach Road, *Smith* 5038.

3. ***M. exigua* (Sm.) Greene, Eryth. 1:90 (1893).**

Sclerocarpus exiguus Sm. Rees Cycl. 31:3 (1816).

Harpaecarpus exiguus Gray, Bot. Mex. Bd. 101 (1859).

Madia filipes Gray, Proc. Am. Acad. 8:391 (1872).

Stem slender, paniculately branched to nearly simple, the whole plant commonly 1-2 dm. high; herbage viscid-glandular, sweet-scented; leaves linear, entire; heads on naked filiform peduncles; involucre 3 mm. high; its bracts 4-8, lunate and strongly carinate, the free tip minute; ligules inconspicuous; bracts of the receptacle united; disk-flower only one; ray-achenes laterally compressed, obovate-lunate, pointed by a small disk.

Grassy hillsides. May to August. *Lyon*; *Brandeggee*; Gallagher's Canyon, *Eastwood* 6462; Rock Falls Canyon, *Moxley* 696; Avalon Canyon alt. 1,000 ft., and Cat Tail Canyon, *Nuttall* 171, 579.

28. HEMIZONIA DC.

Mostly annual or biennial herbs (one of our species somewhat woody) with at least the upper leaves alternate. Flowers yellow or white, in mostly numerous heads. Receptacle flat, its bracts deciduous. Ray-achenes obcompressed with a broad back, thick and turgid (never laterally compressed with narrow back), each partially enclosed by the lower part of its involucre bract. Disk-achenes sterile.

Flowers yellow, leaves linear or broader.

Rays 8-20, disk-flowers as many or more:

Perennial, herbage not glandular

Annual, at least the involucre glandular

Beak of ray-achenes curved

Beak of ray-achenes straight

Rays 3-8, disk-flowers not over 10

1. *clementina*

2. *paniculata*

3. *floribunda*

4. *fasciculata*

1. **H. clementina** Brandeg. Eryth. 7:70 (1899).

Hemizonia Streetsii Gray, Syn. Fl. 1, 2:451 (1866*).

Plant probably a half-shrubby perennial, 3-6 dm. high; stems many, at length much branched and leafy to the numerous cymosely crowded heads; herbage sparsely hirsute, not conspicuously glandular, but more or less viscid above; leaves rigid, linear, entire or with a few short teeth; rays 12-20; disk-flowers numerous; ray-achenes rugose-tuberculate, stipitate, beaked; pappus-paleae of disk-achenes about 10, subulate-linear, unequal.

Dry situations. June to October. At Isthmus, *Nevin & Lyon*; *Trask*; *Brandeg*; vicinity of Avalon, *Eastwood* 6492, 6533; *McClatchie* (N. Y., Field).
TARWEED.

2. **H. paniculata** Gray, Proc. Am. Acad. 19:17 (1883).

Diffusely branched above, 3-10 dm. high; the stem hirsute below, viscid-glandular above; cauline leaves narrowly oblong, lacinate-pinnatifid; those of the numerous short branchlets crowded, erect, entire; ray-flowers usually 8; their achenes rugose or pitted on the back and with a short upturned beak at summit of inner angle; disk-achenes usually about 13 (11-20), pubescent; their 8-10 oblong pappus-paleae equalling the proper tube of the corolla and conspicuously pubescent or even erose at the summit.

Dry open situations. May to September. Pebble Beach Road, *Pendleton* 1357; *Smith* 5048, 5055; dried bed of Echo Lake *Knopf* 148.

3. **H. floribunda** Gray, Proc. Am. Acad. 11:79 (1876).

A stout erect annual 6 dm. or more high, the very leafy stem terminating in an elongated raceme or racemose panicle; herbage minutely glandular but not hirsute; cauline leaves linear, 1-3 cm. long, entire; ray-achenes about 20, in more than one series, somewhat tuberculate-rugose, with very short straight beak; pappus-paleae of the numerous disk-achenes 5-8, shorter than the proper tube of the corolla, acute, conspicuously hirsute.

Dry situations. May to September. Pebble Beach Road, in decumbent patches a half to one meter across, on the sea cliff, *Nuttall* 195, 352; and on the southwest hillside at the Isthmus 260.

4. **H. fasciculata** (DC) T. & Gr. Fl. 2:397 (1843).

Hartmannia fasciculata DC. Prodr. 5:693 (1836).

Paniculately branched above the base, 2-6 dm. high; herbage

* In part. Not of Proc. Am. Acad. 12:162 (1877).

sparsely hirsute and hispid, or disposed to be nearly glabrous above; radical leaves pinnately parted, 4-8 cm. long; stem-leaves linear to oblanceolate, lacinate-pinnatifid, few-toothed or entire; those of the branchlets shorter and mostly entire; heads fascicled in rather dense small clusters, normally with 5 rays and 6 disk-flowers; bracts of the involucre glabrous or glandular-hispidulous, carinate by a thickened midrib, those of the receptacle slightly united; corolla lobes pubescent; ray-achenes smoothish or transversely rugose, with a very short beak; disk-achenes with a pappus of 6-10 linear paleae some of which are toothed or lacerate at tip.

Dry situations. May to September. *Lyon*; *Brandegee*; near Avalon, *Hasse* (reported as *H. Wrightii*, specimen in hb. Field); *Reed* 2822; *Hall* 8285; *Eastwood* 6487; *Smith* 5009; *Nuttall* 197, 575; *Pendleton* 1357; *Knopf* 208; 140.

The form of more diffuse growth and less fascicled or all scattered heads—*H. ramosissima* Benth—grows on a hillside at the Isthmus, *Nuttall* 806.

29. BLEPHARIPAPPUS Hook.

Vernal annuals with mainly alternate leaves and medium-sized heads on evident peduncles. Bracts of the involucre flattened on the back below with abruptly dilated thin margins infolded so as to enclose the ray-achene, the tip flat. Ray-flowers 8-20; ligules yellow, white, yellow tipped with white, or roseate. Disk-corollas yellow their lobes hirsute or villous. Receptacle broad and flat, with a row of thin bracts, between ray- and disk-flowers and sometimes additional ones among the flowers. Ray-achenes obcompressed, commonly glabrous, destitute of pappus, fertile. Disk-achenes usually pubescent, mostly sterile, in ours bearing a pappus of 5-20 bristles or awns, these rarely wanting in the species here recorded.

1. *B. platyglossus* Greene, *Pittonia* 2:246 (1892).

Callichroa platyglossa F. & M. Ind. Sem. Petr. 2:31 (1835).

Laya platyglossa Gray, Pl. Fendl. 103 (1849).

Laya platyglossa breviseta Gray, Bot. Calif. 1:370 (1876).

Simple or more commonly branching below, erect or sometimes diffuse, 2-6 or 8 dm. high; herbage short-hirsute and usually with some small stipitate glands; basal leaves oblong, toothed or pinnatifid, the rameal narrower and either toothed or entire, the uppermost linear and entire; peduncles turbinate-thickened beneath the head; involucre bracts linear, with broad tips; rays 5-13, sulphur-yellow, the tips commonly white, in *Nuttall* 294 purple, 1-1.2 cm. long; disk-achenes somewhat flattened, densely clothed with appressed silky hairs; pappus of 15-20 upwardly scabrous stout awn-like bristles nearly as long as the corolla, neither villous nor plumose, rarely wanting.

Grassy levels and slopes. March to June. *Gambel* in hb. Gray; *Lyon* (Gray; Field); *Brandegee*; Hay Press, Isthmus Cove and Howland's, *Mills*. 4779, 4813, 4877; at the first station, *Nuttall* 294, 1207; *Knopf* 48, 73; Cottonwood Canyon, *Knopf* 397. TIDY-TIPS.

30. *ACHYRACHÆNA* Schauer.

Soft-pubescent annual with narrow leaves, the lower opposite, and rather large heads terminating the few erect branches. Involucre oblong-campanulate, its bracts lanceolate, each enfolding a ray-achene. Bracts of the receptacle membranous, in a single series between ray and disk. Ray flowers 5-10, little exceeding the disk; their ligules short and broad, palmately 3-cleft. Ray-achenes fertile, linear-clavate, all the ribs or the alternate scabrous. Disk-achenes with a pappus of about 10 silvery scales, the outer as long as the achene, the inner nearly twice as long.

1. *A. mollis* Schauer, Del. Sem. Hort. Vratisl. 3 (1837).

Erect, simple or branching, 2-4 dm. high, pilose-pubescent; leaves linear, remotely toothed or entire, 12 cm. or less long; heads solitary, in flower 15-20 mm. high, in fruit expanding and becoming globose, then 3 or 4 cm. broad; rays light-yellow, soon changing to reddish-brown; paleæ of the achenes expanding or rotately diverging.

The only knowledge of this plant that we have is its inclusion in *Brandegee's* list. The species must have a very limited (probably local) habitat or its conspicuousness alone would have caused others to collect it.

Tribe 8. *INULEÆ*—Herbs, shrubs, or rarely trees, with mostly white-wooly or glandular herbage. Leaves alternate (opposite in *Psilocarphus*) entire, or more or less dentate in one species of *Pluchea* (as to California). Heads rather small and discoid in all our species, homogamous or heterogamous, dioecious in some genera; Bracts of the involucre commonly white or scarious. Anthers, with very few exceptions, caudate at base the tails free or united in pairs. Style-branches of various forms but mostly obtuse or truncate, with marginal stigmatic lines on the inner surface, not appendaged. Pappus in all our species capillary or none.

Receptacle chaffy:

Fertile pistillate flowers destitute of pappus:

Receptacle slender. Leaves alternate

Receptacle globose. Leaves opposite

Fertile pistillate flowers (inner) with abundant pappus

Receptacle naked:

Herbaceous, Herbage woolly

Herbage glandular

Shrubby with willow-like stems

31. *STYLOCLINE*

32. *PSILOCARPHUS*

33. *FILAGO*

34. *GNAPHALIUM*

35. *PLUCHEA*

35. *PLUCHEA*

31. **STYLOCLINE** Nutt.

Low, erect or spreading woolly annuals with small ovoid or nearly globular clustered heads. Receptacle column-like or almost filiform, bearing at its tip, and therefore in the center of the head, 4 or 5 sterile hermaphrodite flowers, each of these commonly subtended by a plane or slightly concave bract. Pistillate flowers marginal, each completely enfolded by the medial or (in one species) the basal portion of its very woolly subtending bract. Pappus none in the fertile flowers, sometimes of a few caducous bristles in the sterile ones.

1. **S. gnaphalioides** Nutt. Trans. Am. Philos. Soc. 2, 7:338 (1841).

Diffusely branched from the base, commonly 5-15 cm. long; leaves broadly linear or spatulate-linear; the upper somewhat broader ones obtuse and 5-12 mm. long; pistillate fertile flowers numerous, their bracts (barely 3 mm. long) ovate, nearly plane on the outer surface, a central portion at the base produced on the inner side into a sac enclosing the achene, this portion firm, the remainder hyaline; sterile flowers little shorter than their bracts. with rudimentary ovary and a pappus of few caducous bristles.

In dry situations. March to September. *Brandege* and *Lyon* lists; banks along Pebble Beach Road, *Smith* 5061; mesa immediately above the ranch houses at Chicken Johnny's, *Mills* 4921; dried bed of Echo Lake, *Knopf* 150.

32. **PSILOCARPHUS** Nutt.

Depressed or prostrate white-woolly annuals. Leaves opposite, entire, the uppermost ones involucrate around the small globose heads which lack a true involucre and are solitary in the forks or at the ends of the branches, or some clustered. Receptacle globose. Bracts of the pistillate flowers clothed with soft wool, crowded on the low receptacle; each bract sac-like, half-obovate in side view, hooded and rounded at the top with the apex introrse (turned downward and inward) and beaked by a hyaline appendage or scale. Pistillate fertile flowers with filiform corolla. Hermaphrodite-sterile flowers few, occupying the center of the head, destitute of enclosing or other bracts. Achenes straight or slightly curved. Pappus none.

1. **P. tenellus** Nutt. Trans. Am. Philos. Soc. 2, 7:341 (1841).

Usually depressed, the forking stems prostrate or ascending forming a dense mat 1-3 dm. broad; herbage canescent with a fine and closely appressed wool; leaves numerous, spatulate or linear.

mucronate, 0.5-1.5 cm. long; heads in all the upper leaf-axils, about 4 mm. wide; achenes oblong or slightly broadened upward.

Dry situations. April to July. Ridge near Summit, *Grant 1256* (in hb. U. S.); *Cherry Canyon, Smith 5082; Moxley 724; School House Mountain near Avalon, Nuttall 24.*

33. *FILAGO* Linn.

Low woolly annuals with more or less glomerate small heads. Receptacle hemispherical or conical. Fertile pistillate flowers in two sets, the outer separated from the inner by a circle of open scarious or chaff-like nearly glabrous bracts; flowers of the outer set, which is borne on the margin of the receptacle, commonly destitute of pappus, each loosely enfolded by a concave or boat-shaped long-woolly bract; flowers of the inner set provided with a pappus of copious capillary bristles, not enfolded by bracts. Hermaphrodite flowers in the center of the head few, often fertile, their pappus abundant. Achenes terete or nearly so, either smooth or minutely granular.

1. *F. californica* Nutt. Trans. Am. Philos. Soc. 2, 7:405 (1841).

Plant, or its branches, erect, 0.5-2 or sometimes 4 dm. high, leafy throughout; leaves 0.8-2 cm. long, narrowly oblong to linear or somewhat spatulate, sessile, commonly apiculate at the apex; heads ovate, 3 or 4 mm. high, scarcely exceeded by the bracts of the inflorescence; receptacle convex, rough; bracts of the outer pistillate flowers 8-10, very woolly, deeply boat-shaped and somewhat incurved at the broad and obtuse hyaline tip; bracts of the inner series thin and less woolly, plane or merely concave; all stellately spreading at maturity; marginal achenes smooth; central achenes either smooth or dotted with shining papillae.

Dry open situations. April to September. On a bare western ridge, *Trask "v"* (herb. N. Y.), "*m*" (herb. U. S.); *Brandegee; Lyon; Pebble Beach Road, Pendleton 1420; Reed 2859; Howland's, Millsp. 4812; Nuttall 47; Descanso Canyon, Moxley 753; Salta Verde, Knopf 341.*

34. *GNAPHALIUM* Linn.

Woolly herbs with sessile and commonly decurrent leaves. Heads white, yellowish or rose-tinted, disposed in panicles, cymes or spikes. Receptacle flat or convex, not chaffy. Involucral bracts scarious, imbricated. Pistillate flowers in several series, with filiform corollas. Central flowers hermaphrodite-fertile, with tubular, 5-lobed corollas and entire, obtuse styles. [Pappus a single series of capillary bristles.]

Pappus-bristles not united at base:

Involucre imbedded in loose wool; bracts brown 1. *palustre*

Involucre woolly only at base; bracts scarious:

Herbage becoming green in age, somewhat glandular:

Root perennial; stems woody below 2. *bicolor*

Root annual or biennial; herbaceous 3. *californicum*

Herbage persistently white-woolly, scarcely glandular:

Heads in loose panicles, involucre white 4. *microcephalum*

Heads in close glomerules, involucre rusty 5. *chilense*

1. **G. palustre** Nutt. Trans. Am. Philos. Soc. 2, 7:403 (1841).

Plants 0.5-1.5 or 2 dm. high; stems commonly several and erect or ascending from an annual root; herbage loosely floccose with long wool, sometimes partially deciduous; leaves nearly all spatulate or a few about the inflorescence oblong or lanceolate 1-3 cm. long; heads in small dense clusters at the ends of the branches; involucre barely 4 mm. high; its bracts linear, brownish or greenish at the base, the pearly-white obtuse tips somewhat denticulate; achenes either smooth or scabrous.

Occasional in moist situations, especially at margin of water. May to September. *Brandegee*. SWAMP EVERLASTING.

2. **G. bicolor** Bioletti, *Erythea* 1:16 (1893).

Stout, 3-6 dm. high from a perennial root; stems branching and lignescent below, terminating above in a compact cyme or branching to form a more or less open panicle the branches of which are terminated by close cymes; herbage glandular, whitened by a very thick, dense tomentum which is deciduous only from the upper surface of the leaves; leaves oblong or linear or the upper lanceolate, closely sessile by a broad auriculate base, 2-5 or 8 cm. long, 0.5-1 (or the lower even 1.5) cm. wide, the margins commonly undulate and revolute; involucre campanulate, 6 mm. high and broad; its bracts white becoming sordid, at least the inner often with a greenish tinge; the outer ovate and obtuse, the inner varying to narrowly oblong and acute.

Dry hillsides and arroyas. January to November. *Trask* (U. S., Field); *Brandegee* list as *Anaphalis margaritacea*; vicinity of Avalon, *Mrs. Trask* 10, 20; *Grant* 519; *Smith* 5073, *Millsp.* 4648; *Nuttall* 17, 292, 992; *Summit*, *Smith* 5112, *Millsp.* 4584. EVERLASTING, CUDWEED. OLDFIELD BALSAM.

3. **G. californicum** DC. Prodr. 6:224 (1837).

Gnaphalium decurrens californicum Gray, Bot. Calif. 1:341 (1876).

Stems stout, 4-8 dm. high from a biennial root, cymosely branched at summit, the branches bearing glomerules of large heads and forming a broad and somewhat flat-topped inflorescence; herbage soon becoming green and more or less glabrate at maturity, glandular and balsamic-scented; lower leaves oblong, 6-12 x 1-2 cm. diminishing in size upward and becoming lanceolate, all obviously decurrent; involucre 6 or 7 mm. high, roundish, its bracts white or in age rusty-tinged.

Dry situations. January to October. Isthmus, *Trask* (U. S., Field); *Eastwood* 6507; Avalon Valley, *Smith* 5074, *Fisher* 135, *Nuttall* 81; Pebble Beach Road and Middle Ranch, *Mills* 4697, 4571; *Knopf* 26; *Rusby*; *McClatchie*; *Macbride & Payson*. CALIFORNIA EVERLASTING.

4. ***G. microcephalum*** Nutt. Trans. Am. Philos. Soc. 2, 7: 404 (1841).

Stems commonly 3-6 or even 9 dm. high, several from the herbaceous perennial base, branching above into an elongated or sometimes broad loose panicle which is usually less than 3 dm. (mostly 1-2 dm.) long; herbage clothed with a bright white persistent woolly tomentum; leaves linear or narrowly oblong or spatulate, the larger ones 4-6 cm. long and 3-12 mm. broad, mostly short-decurrent; heads small, disposed in rather small glomerules or clusters at the ends of the branches of the panicle; involucre narrow, 5 or 6 mm. high; bracts ovate or oblong and obtuse at apex, or the very innermost linear, bright white.

In arroyas and canyon stream beds. September. Big Wash Canyon and the upper reaches of Hamilton Canyon above the Wishbone, *Nuttall* 903, 862; *Knopf* 17, 67, 70; *Eastwood* 6473.

5. ***G. chilense*** Spreng. Syst. 3: 480 (1826).
Gnaphalium Sprengelii H. & A. Bot. Beech. 150 (1833).

Plant 1.5-6 dm. high from an annual or biennial root, stems either several and erect from a decumbent base or single and wholly erect, terminating in a large close glomerule or branching above into a more or less open panicle less than 1.5 dm. long the branches of which are terminated by close glomerules; leaves narrowly spatulate the larger ones 3-6 cm. by 4-12 mm., or the uppermost linear or lanceolate, the short decurrent base rather broad and somewhat auriculate; involucre roundish, 5 or 6 mm. high and broad, the bracts with a greenish-yellow tinge.

Dry situations. May to October. Vicinity of Avalon. *Trask* (N. Y., Field); *Brandegee*; *Fisher*; *Smith* 4989; Gallagher's Canyon, *Eastwood* 6463; Mountain Top near Coach Road at Summit, *Nuttall* 288; *Knopf* 43, 121. COTTON-BATTING PLANT.

35. **PLUCHEA** Cass.

Tall leafy herbs or shrubs. Heads numerous, clustered in corymb-like terminal cymes, hemispheric, discoid, the numerous flowers purplish. Marginal flowers of the head pistillate and perfect, with tubular-filiform truncate entire or 2 or 3-toothed corolla and slender 2-cleft style; central flowers few, perfect but sometimes sterile, with tubular 5-cleft corolla (enlarged above) and trifid or merely notched style. Involucre imbricated. Receptacle

flat, naked. Achenes grooved. Pappus a single series of capillary bristles.

Herb; glandular pubescent

Shrub; pubescence silvery; close, dense

1. *camphorata*

2. *sericea*

1. *P. camphorata* (L.) DC. Prodr. 5:452 (1836).

Erigeron camphoratus Linn. Sp. Pl. ed. 2:1212 (1763).

An erect annual, branching above, 3-8 dm. high (ours 8-16 dm.); herbage soft-puberlent, glandular above; leaves ovate-oblong or lanceolate, acute at each end, glandular-dentate, short-petioled or the upper sessile, the larger 7-14 cm. long (ours 2 dm. and less), and 2 or 3 cm. (ours up to 5 cm.) broad; involucre bracts chartaceous, ovate-lanceolate, commonly reddish; central hermaphrodite flowers varying from 10 or 12 to numerous; achenes pubescent; pappus bristles all slender, not at all dilated above.

In moist (usually saline) situations. August to November. *Trask; McClatchie*. A wet spot in Soap Stone Quarry, *Nuttall* 904.

2. *P. sericea* (Nutt.) Coville, Contr. U. S. Nat. Hb. 4:128 (1893).

Polypappus sericeus Nutt. Pl. Gamb, 178 (1848).

Pluchea borealis Gray, Proc. Am. Acad. 17:212 (1882).

A slender willow-like shrub 2-5 m. high; herbage silvery-silky throughout except on the old stems; leaves alternate, entire, linear-lanceolate, 1-3.6 cm. by 3-6 mm., acute at apex, tapering to the sessile base; the outer involucre bracts brown or purplish, firm-coriaceous, the white inner ones much thinner; style-branches of the pistillate flowers slender, long-exserted at maturity; central hermaphrodite flowers 20 or less their pappus-bristles slightly dilated at the tip.

Margins of wet places. May to October. *Brandegee; Trask; McClatchie; Macbride & Payson* 841; East End, *Smith* 5121; Pebble Beach, *Nuttall* 188, 797. ARROW-WEED.

Tribe 9. *CYNAREÆ* — Thistles or thistle-like herbs with alternate mostly prickly leaves. Heads large, homogamous, the flowers all perfect, or sometimes heterogamous the marginal flowers then radiatiform and commonly neutral. Bracts of the involucre imbricated, usually prolonged into a spine or bristle, or provided with a membranous edge. Receptacle bristly or hairy, seldom with true bracts. Rays none. Corollas tubular, cleft into long narrow lobes. Anthers with elongated appendage at the tip, caudate at the base. Style-branches short, commonly united up to the obtuse tips, commonly with a pubescent ring below. Pappus bristly or plumose rarely paleaceous or wanting.

Achenes inserted by their very base:

Filaments distinct

Filaments united below into a tube

Achenes obliquely inserted

36. *CIRSIMUM*

37. *SILYBUM*

38. *CENTAUREA*

36. **CIRSIUM** Scop.

Spiny herbs with mostly lobed or pinnatifid alternate or basal leaves, all of ours more or less tomentose. Heads large, solitary or clustered, homogamous (rarely dioecious); the flowers white, reddish or crimson. Involucral bracts imbricate, the outer terminating in spines, the inner aspinous. Receptacle soft-bristly or hairy, not fleshy. Corollas tubular, their segments linear-filiform. Achenes compressed or 4-angled, smooth in all our species. Pappus of a single series of bristles connate at the very base and deciduous as a whole.

1. **C. occidentale** (Nutt.) Jepson, Fl. W. Mid. Calif. 509 (1901).

Carduus occidentalis Nutt. Trans. Am. Philos. Soc. 2, 7:418 (1841).

Cnicus occidentalis Gray, Proc. Am. Acad. 10:45 (1874).

Stout, 5-10 dm. high, white with a thick coating of cottony wool when young; leaves from sinuate-dentate to pinnatifid, not very prickly, glabrate above, canescent beneath; heads subglobose on nearly naked peduncles; involucre 3-6 cm. high; its bracts straight and subulate-lanceolate, with slender spines, not widely spreading, densely festooned with cobwebby hairs: flowers red or purple; corolla segments longer than the throat; anther-tips narrow and acuminate: pappus rather scanty.

Stony and sandy arroyas. February to July. *Lyon*; *Trask* (U. S., Field); *Brandege*; *Eastwood* 6497; Avalon Valley, *Smith* 5004; *Mills* 4893, *Nuttall* 72, 78; Hamilton, Gallagher's and Silver Canyons, *Mills* 4703, 4876, 4882; *Knopf* 116. THISTLE.

37. **SILYBUM** Vaill.

Annual or biennial herbs with very ample prickly clasping leaves smooth and shining above and very conspicuously blotched with white along the veins. Heads very large, solitary at the ends of the branches, homogamous. Bracts of the involucre broad, appressed, bearing an abruptly spreading spine which is broadly lanceolate or ovate and ciliate-prickly toward the base. Flowers purple. Corollas with filiform tube conspicuously dilated below the narrowly linear lobes. Pappus-bristles in several series, flattish, minutely barbellate.

1. **S. Marianum** (L.) Gærtn. Fruct. 2:378 (1791).

Carduus Marianus Linn. Sp. Pl. 823 (1753).

Branching, 10-20 dm. high; lower leaves 5 dm. or more long and over 1 dm. wide, sinuate-pinnatifid, strongly undulate at the sinuses; upper leaves smaller, nearly spinulose-toothed; heads 2.5-5 cm. broad.

exclusive of the broad stout spreading or recurved spines which are often 3 cm. long.

A European introduction becoming naturalized. June to July. *Trask* (N. Y., Field); *Brandegee*. Sea beach at the mouth of Silver Canyon, *Nuttall* 316. MILK THISTLE.

38. *CENTAUREA* Linn.

Erect or diffuse usually rigid herbs with alternate leaves and medium-sized or large heads. Involucre ovoid or globose the bracts imbricated and ending in a needle-like spine or in a fringed or toothed (rarely entire) appendage. Receptacle densely bristly the bristles persistent. Flowers all tubular, the marginal much larger and neutral or the heads homogamous. Achenes somewhat compressed, mostly smooth, notched just above the base indicating the oblique or lateral attachment.

1. *C. Melitensis* Linn. Sp. Pl. 917 (1753).

An erect, commonly much branched annual, 3-8 dm. high, with a roughish indument, the stems narrowly winged by the decurrent leaves; basal leaves pinnatifid, the upper narrow and mostly entire; heads terminal and solitary, or 2-3 together; involucre 1 cm. high its bracts rigid, the outer with palmatifid spine, the intermediate and inner ones with a rigid spine 5-10 mm. long which is either simple or with divaricate short spines at base; flowers yellow; pappus-bristles in about 3 rows, the middle row long, the outer and inner very short.

Established from Europe, in waste ground. February to July. *Lyon*; *Brandegee*; vicinity of Avalon, *Eastwood* 6479 (hairy), 6480 (glabrous, Gray, Field); on the Golf Links, *Mills* 4713; Pebble Beach Road, *Smith* 5039, *Nuttall* 74; *Knopf* 128. TECALOTE, STAR THISTLE

Tribe 10. *MUTISIEÆ*—Herbs and shrubs or rarely twining or arborescent plants. Leaves alternate. Receptacle mostly naked. Heads in our genera homogamous the flowers all perfect and the corolla bilabiate. Anthers with long tails at base; anther-tips also elongated. Style-branches of perfect flowers not appendaged, usually short and blunt, without node below.

39. *PEREZIA* Lag.

Perennial branching herbs. Involucre imbricated; bracts chartaceous or coriaceous. Receptacle flat, usually naked. Flowers never yellow. Style-branches flattened above, truncate. Achenes elongated-oblong, terete, sometimes narrowed at apex but not beaked. Pappus of many capillary scabrous bristles.

1. ***P. microcephala* (DC.) Gray, Pl. Wr. 1:127 (1852).**

Acourtia microcephala DC. Prodr. 7:66 (1838).

Somewhat stout, commonly 1 meter or more high, leafy; herbage scabrous-puberulent and minutely glandular; leaves thin, 1-2 dm. long by 3-8 cm. broad, oblong, mostly acute, sessile by a broad or clasping base, finely and closely denticulate; heads numerous in terminal cymose panicles, 10-15-flowered; involucre 7-9 mm. high; bracts oblong, abruptly acuminate or mucronate; corollas rose-color or whitish or pure white, bilabiate, the outer lip, and 3-toothed inner, 2-lobed; pappus soft, white.

In the chaparral. May to September. *Lyon*; *Brandege*; vicinity of Avalon, *Eastwood* 6493 (labelled *P. sericophylla*); Pebble Beach Road, *Pendleton* 1368, *Nuttall* 353; without locality and in Cherry Canyon, *Smith* 4975, 5081; Banning Valley Camp, *Knopf* 169.

Phylum B. PTERIDOPHYTA.

FERNS AND FERN-ALLIES

Plants containing woody and vascular tissues, producing spores asexually, which, on germination, develop small flat mostly green prothallia (*gametophyte*). On these are borne the reproductive organs, the female known as archegones, the male as antherids. From the fertilization of the egg in the archegone by spermatozoids produced in the antherid, the asexual phase (*sporophyte*) of the plant is developed; this phase is represented by an ordinary fern, lycopod, or horsetail.

Spores produced in sporanges borne on the leaves, or paniced, or in special conceptacles

1. FILICALES

Spores produced in sporanges clustered underneath the scales of terminal cone-like spikes

2. EUISETALES

Spores produced in sporanges borne in the axils of scale-like leaves

3. LYCOPODIALES

Order 1. FILICALES.*

Spores all of one kind and size, produced in sporanges, which are borne usually in clusters (*sori*) on the back of a leaf or on greatly modified pinnae.

Family 1. POLYPODIACEÆ.

Ferns of various habit, the rootstocks horizontal and often elongated, or short and erect, the leaves entire, pinnate, pinnatifid or decompound, coiled in vernation, mostly with petioles (*stipes*). Sporangies borne in clusters (*sori*) on the lower side or margins of the leaves

*Determinations by Wm. R. Maxon.

or their segments, stalked, provided with a vertical ring, opening transversely. Sori with or without a membranous covering (*indusium*). Prothallium green.

Sori marginal or submarginal:

Sori interrupted on leaf-lobes at the ends of the veins

1. ADIANTUM

Sori continuous around the leaf segments

2. PELLAEA

Sori dorsal, orbicular or nearly so:

Sori without indusia:

Sori nearly confluent, leaves powdery beneath

3. PITYROGRAMMA

Sori distinctly separate, leaves not powdery beneath

4. POLYPODIUM

Sori with indusia:

Sori borne on the backs of veins

5. DRYOPTERIS

1. ADIANTUM Linn.

Graceful ferns of rocky hillsides, woods, and ravines, with much divided leaves and short marginal sori borne on the under side of the reflexed and altered portion of the pinnule, which serves as an indusium. Stipes and branches of the leaves slender or filiform, often polished and shining.

Indusia recurving only a portion of the leaf-margin

1. Capillus-Veneris

Indusia recurving the entire leaf-margin

2. Jordani

1. A. Capillus-Veneris Linn. Sp. Pl. 1096 (1753).

Rootstock creeping, rather slender, chaffy with light-brown scales. Stipes very slender, black, or nearly so and shining, 7.6-30 cm. long; blades ovate-lanceolate in outline, 2-pinnate below, simply pinnate above, membranous, 15.3-60 cm. long, 10-30 cm. wide at the base; pinnules and upper pinnae wedge-obovate or rhomboid, rather long-stalked, glabrous, the upper margin rounded and more or less deeply incised, the sterile lobes crenate or dentate-serrate, the fertile ones with lunate or transversely oblong indusia; main and secondary rachises and stalks of the pinnules black or dark brown.

Rare. On rocks near permanent water. June to September. *Norris; McClatchie*; rock of waterfall near mouth of Cottonwood Creek, *Nuttall 851*. MAIDEN-HAIR.

2. A. Jordani C. Muell. Bot. Zeit. 22: 25 (1864).

Plant 15.3 cm. to 6.8 dm. high, usually erect; stalks rather stouter than the last, nearly black, polished, about half the whole height of the plant; fronds broadly ovate or deltoid-pyramidal, simply pinnate towards the apex, 2-3-pinnate below; pinnae obliquely spreading, lower ones half as long as the frond; pinnules long-stalked, 8.4-31.5 mm. broad, roundish or semi-circular or even reniform the lower sides

entire, the outer edge rounded, slightly 2-5-lobed, finely and sharply toothed in the sterile fronds, but in the fertile recurved and forming pale transversely elongated involucre.

Prevalent on moist canyon slopes in shade. In fruit January to June. *Mrs. Trask*; *Lyon*; *Brandegee* (as *A. emarginatum*); *Cherry Canyon*, *Smith* 5083, *Fisher*; *Gallagher's Canyon*, *Eastwood* 6465, *Millsp.* 4463, 4870; *Equestrian Trail*, *Rattlesnake Canyon*, and *White's Landing*, *Millsp.* 4773, 4594, 4859; *Avalon Valley*, *Golf Links Canyon* and *Piedra Escalera Canyon*, *Nuttall* 586, 587, 86, 738; *Pebble Beach Canyon*, *Nuttall* 201, 361, 720, 1086, 1126, *Knopf* 30, 83. CALIFORNIA MAIDEN-HAIR.

2. PELLÆA Link.

Rock-loving small or medium-sized ferns, with nearly uniform leaves, the blades 1-3-pinnate, smooth, the fertile divisions commonly narrower than the sterile. Sori roundish or elongate, on the free veins, usually confluent in a submarginal line. Indusium formed by the reflexed margins of the segments.

Pinnules obtuse or emarginate
Pinnules rigidly mucronulate

1. *andromedæfolia*
2. *mucronata*

1. *P. andromedæfolia* (Kaulf.) Fée, Gen. Fil. 129 (1850-2).
Pteris andromedæfolia Kaulf. Enum. Fil. 138 (1824).

Rootstock slender, creeping, chaffy with narrow rusty scales; stalks scattered, erect, terete, smooth, brownish or reddish, chaffy at the base, variable in length: fronds 10.1-60.8 cm. long, ovate or ovate-oblong, 2-4-pinnate; primary pinnae spreading, oftenest opposite, ovate-lanceolate; ultimate pinnules glaucescent, subsessile, 4.2-8.4 mm. long, broadly oval, slightly cordate and emarginate, fertile ones with the edges rolled back to the midvein: involucre herbaceous with a narrow whitish edge.

Under bushes and large rocks on canyon slopes. In fruit February to July. *Trask*; *Brandegee*; *Avalon Valley* and *Hay Press*, *Millsp.* 4559, 4677; *Golf Links Canyon*, *Big Wash Canyon* and *Snake Canyon*, *Nuttall* 90, 346, 721, 736; *Rock Spring Canyon*, *Knopf* 124. COFFEE FERN.

2. *P. mucronata* D. C. Eaton, Torr. Mex. Bound. Bot. 233 (1859).
Allosorus mucronatus D. C. Eaton, Am. Jour. Sci. 2, 22:138 (1856).
Pellaea ornithopus Hook. Sp. Fil. 2:143 (1858).

Rootstock short, thick, knotted, densely chaffy with very narrow dark-brown scales; stalks clustered, rather stout and very rigid, dark-purplish or almost black, polished, 5.1-25.4 cm. long; fronds 10.1-30.3 cm. long, rigid, broadly ovate-lanceolate, tripinnate or in smaller plants bipinnate; primary pinnae spreading or obliquely ascending, linear, bearing from a few up to 16 pairs of usually trifoliate, but varying to simple or to 5-7-foliate, nearly sessile pinnules, which are

commonly 3-6.3 mm. long, coriaceous, mucronulate, glaucescent beneath, roundish-quadrate in the very rare sterile fronds, and in the fertile fronds having the margins rolled back to the midvein.

Common, but most plentiful beneath *Opuntia* clumps. In fruit the year around. *Lyons*; *Trask*; *Brandegee*; Equestrian Trail, *Mills*. 4655; Avalon Canyon, *Nuttall* 130, 711; Snake Canyon, *Nuttall* 1151; Rock Spring Canyon. *Knopf* 282; ridge between Descanso and Hamilton Canyons, *Mills*. 4467. TEA FERN, CALAGUALA.

The dried leaves, when steeped, make a fragrant, pleasant tea. Also used thus as a tonic and remedy for pulmonary affections.

3. PITYROGRAMMA Link.

Terrestrial ferns, with tufted, mostly bipinnate leaves, usually white-powdery or yellow-powdery on the under side, the sori dorsal, linear along the veins, nearly confluent. Indusia wanting.

Upper surface of lamina glabrous	1. triangularis
Upper surface of lamina glandular, viscid, or both	2. viscosa

1. *P. triangularis* (Kaulf.) Maxon, Contr. U. S. Natl. Herb. 17:173 (1913).

Gymnogramme triangularis Kaulf. Enum. Fil. 73 (1824).

Stalks densely tufted, slender, blackish-brown, polished, 1-3.3 dm. long; fronds deltoid or pentagonal, 5.1-12.7 cm. long and nearly as broad, pinnate; the lower pair of pinnæ much the largest, triangular, broadest on the lower side, bipinnatifid; the rest oblong or lanceolate, more or less pinnately lobed or incised; segments rounded-obtuse, crenated; lower surface coated with a yellow or white waxy powder, upper surface smooth or minutely granular; lines of fruit forking, bursting through the colored powder, and at length nearly obscuring it.

On dry canyon slopes, common. In fruit April to August. *Trask*; *Brandegee* (Greene's list as *Notholaena candida*); under scrub oaks at the Wishbone, beyond the Summit and in Middle Ranch Canyon, *Mills*. 4566, 4567, 4574; hillside in Avalon Valley, *Moxley* 745; Hamilton and Pebble Beach Canyons, *Knopf* 82, 176; Golf Links Canyon, *Nuttall* 87. GOLDEN BACK, GOLD FERN.

2. *P. viscosa* (Nutt.) Maxon, Contr. Nat. Herb. 17:173 (1913).

Gymnogramme viscosa Nutt. D. C. Eaton, Ferns of Southwest 305 (1878).

Ceropteris viscosa Undw. Bull. Torr. Club 29:631 (1902).

Pityrogramma triangularis viscosa Weatherby, Rhod. 22:117 (1920).

Frond ovate-pyramidal; pinnæ rather distant; upper surface viscid, as if varnished; powder of the lower surface creamy white.

Common on canyon slopes in the shade of scrub oaks. In fruit April to August. *Lyons*; *Trask*; *Brandegee*; *Grant* 122; Avalon Valley, on a steep, grassy slope under oaks, *Mills*. 4501, *Moxley* 688, 745, *Fisher*; Hamilton Canyon on a grassy slope at the base of rocks, *Mills*. 4464; Descanso Canyon slopes, *Mills*. 4466, *Knopf* 108; open rocky place above Chicken Johnny's, Pebble Beach and Snake Canyons, *Nuttall* 141, 200, 737. STICKY FERN.

4. POLYPODIUM Linn.

Mainly shade-loving species of various habit, commonly epiphytic in the humid tropics, the leaves articulate to the creeping or ascending rhizome at the base of the stipe, the blades ranging from simple to bipinnate or several times pinnatifid, the veins free. Sori round or less commonly oval or elliptical, dorsal or sometimes terminal on the veins. Indusia wanting.

1. *P. californicum* Kaulf. Enum. Fil. 102 (1824).

P. intermedium H. & A. Bot. Beech. 405 (1841) non Muhl.

Stalks moderately slender; fronds from 5.1-30.6 cm. long, papery-herbaceous or, if grown near the sea, subcoriaceous, ovate or ovate-oblong, pinnatifid almost to the midrib; segments numerous, oblong-linear, acute or obtuse, the lower ones mostly opposite, narrowed at the lower side of the base, and separated by rounded sinuses, the upper ones often opposite, dilated at the base, especially on the upper side, and separated by narrow sinuses; margins obscurely or plainly serrate, rarely even incised; veins with four to six veinlets, and often forming a single series of oblique areolations which extend nearly to the margin: sori somewhat oval, rather remote from the margin.

On rocky canyon slopes and bases of cliff rocks. In fruit January to June. *Trask*; *Brandeggee*; crevices of exposed cliff along Pebble Beach Road, *Mills* sp. 4521, 4637, 4638, *Moxley* 733; same situation Lookout Point, *Mills* sp. 4556; crevices of wet rock in Swain's Canyon, *Mills* sp. 4593; in the shade of low scrub oaks at the Wishbone and in Middle Ranch Canyon, *Mills* sp. 4565, 4573; on a grassy slope of Hamilton Canyon, *Mills* sp. 4465; Golf Links Canyon, *Nuttall* 85. CALIFORNIA. POLYPODY.

[*P. Scouleri*. Mrs. Trask's wording of her report of this species on Santa Catalina (*Erythea* 7:142) plainly indicates that the plants she had in mind could not have been this species. Parish says (*Fern Bull.* 9:40): "Mrs. Trask's specimens are really vigorous forms of *P. californicum*." Brandeggee's listing of the species (*Zoe* 1:115) is based solely upon Mrs. Trask stating to him that it grew upon the island. It does not appear in his herbarium.]

5. DRYOPTERIS Adans.

Ferns with simple to 2-3-pinnate or pinnatifid leaves and round sori usually borne on the backs of the veins, the fertile and sterile leaves usually similar. Indusium flattish, roundish-reniform, superior, fixed by its sinus, or the indusium minute and vestigial or altogether wanting. Stipe continuous, not jointed with the rootstock. Veins free or anastomosing.

1. *D. arguta* (Kaulf.) Watt. *Canad. Nat.* 2, 13:159 (1867).

Aspidium argutum Kaulf. Enum. Fil. 242 (1824).

Root-stock stout; rather short, ascending, very chaffy; stalks 22.9 cm. to 3.3 dm. long, erect, rigid, chaffy with ample bright-fer-

ruginous pointed scales; fronds in a crown, half-evergreen, firm-membranaceous or sub-coriaceous, smooth and green above, paler and more or less glandular beneath, 3.3-6.8 dm. long, ovate-lanceolate or triangular-lanceolate, usually fully bipinnate; pinnæ broadly oblong-lanceolate, the lowest ones widest but scarcely shorter than the middle ones; pinnules oblong, pinnately incised or doubly serrate, with spinulose teeth, conspicuously veiny; veins much branched; sori large, nearer the midrib than the margin; indusia firm, convex, orbicular, with a very narrow sinus, the edge bearing short-stalked glands.

Close under thickly leafing shrubs. In fruit February to September. *Trask; Brandegee* (as *Aspidium rigidum*); *Lyon* (in herb. Gray); *Brandegee* (as *Aspidium aculeatum*); under a dark mass of shrubs near the Wishbone, *Mills* sp. 4564; Banning's Canyon, canyon opposite Chicken Johnny's and Hamilton Canyon, *Nuttall* 335, 723, 863; Pebble Beach Canyon, *Mills* sp. 4693, *Nuttall* 199, 360; *Knopf* 244. YERBA DEL GOLFE.

It is claimed that a hot infusion of the rootstalks applied to painful bruises causes a prompt relief of the pain and discoloration.

[*Cheilanthes californica* Mett. reported by Mrs. Trask (in *Erythea* 7: 142), and copied into Brandegee's list, must be an error. No Catalina plant of this species has been seen by us either in herbaria or in the field.]

Order 2. EUISETALES.*

Rush-like perennial plants, with horizontal rootstocks and mostly hollow-jointed simple or often much-branched grooved stems, provided with a double series of cavities and usually with a large central one. the branches whorled, the nodes provided with diaphragms. Leaves reduced to toothed sheaths at the joints. Sporangies with one cavity, clustered underneath the scales of terminal spike-like cones. Spores uniform, furnished with 2 narrow appendages (elaters) attached at the middle, coiling around the spores when moist, and spreading when dry, in diverse ways. Prothallia terrestrial, green, dioecious, or some species monoecious.

Family 1. EUISETACEÆ.

EUSETAIL FAMILY

Characters of the order as above.

1. EUISETUM Linn.

Characters as above.

Sheath segments not with a central groove, teeth deciduous.

1. kansanum

Sheath segments and persistent teeth of both the main stems and branches bicarinate with a deep central groove.

2. Telnateia

* By John H. Schaffner.

1. *E. kansanum* Schaffn. Ohio Nat. 13:21 (1912).

Aerial stems usually 3-9 dm. high, annual, very smooth, 15-30 grooved, usually without simple branches unless broken off; color mostly light-green; surface of the ridges and grooves with cross or diagonal bands; sheaths long, dilated above and usually constricted at the base, green with a narrow black band at the top, teeth deciduous; cones ovate or oblong-ovate, without a point, the apex obtuse or merely acute.

Bare clayey banks. July to August. Middle Ranch Canyon, *Nuttall* 299, 732. (This may be the *E. robustum* of *Davidson* (*Erythea* 2:30), and *E. mexicanum* of *McClatchie* (*ibid.* 122). KANSAS SCOURING-RUSH.

2. *E. Telmateia* Ehrh. Hannov. Mag. 287 (1783). Milde, Nov. Act. Acad. Caes. Leop. 32, 2:240 (1865).

Stems stout, often thick as one's finger; the sterile ones ivory-white or greenish, 6-20 dm. high, 20-40-furrowed, the ridges smooth; branches verticillate, very numerous, erect-spreading, usually simple, 4-6-sided, the ridges rough and deeply sulcate, the lowest joint shorter than the sheath of the stem; fertile stems brownish-white or brown, many-furrowed, the loose brownish sheaths very long, often longer than the internodes: cones 2.6-7.6 cm. long.

In water, June to July. In the stream of Middle Ranch Canyon below Eagle's Nest, *Nuttall* 848, *Knopf* 248. IVORY HORSETAIL.

Order 3. LYCOPODIALES.

Spores produced in sporanges, which are borne in the axils of scale-like or elongated leaves.

Family 1. SELAGINACEÆ.

RESURRECTION-PLANT FAMILY

Terrestrial, annual or perennial, moss-like plants with branching stems and scale-like leaves, which are many-ranked and uniform, or 4-ranked and of two types spreading in two planes. Sporangies 1-celled, solitary in the axils of leaves which are so arranged as to form more or less quadrangular spikes, some containing 4 macrospores (macrosporangies), others containing numerous microspores (microsporangies), which develop into small prothallia, those from the macrospores bearing archegones, those from the microspores antherids. The family consists of the following genus:

1. SELAGINELLA Beauv.

Characters of the family.

1. *S. Bigelovii* Underw. Bull. Torr. Bot. Club. 25:130 (1898).

Stems slender, 10-20 cm. long, mostly ascending, flexuous, usually with short ascending primary branches; secondary branches infrequent and mostly very short; stems rooting only near the base; leaves about six-ranked, appressed-imbricate, usually with a distinct dorsal channel, narrowly lanceolate, tapering gradually into a densely spinulose white awn often 0.7 mm. long; margins with 12-15 cilia on either side which are directed forward and usually less than 50 μ long; spikes obtusely quadrangular, mostly on short lateral branches 5 mm. or less long, the bracts short, broadly ovate but otherwise like the leaves.

Dry hillsides and ridges, common. Not collected in fruit. *Lyon; Brandegee* (as *S. rupestris*); *Grant & Wheeler* 00126; slope of Rock Spring Canyon, *Mills* 4502; ridge between Rock Spring and Rock Falls Canyons, *Nuttall* 553; foot trail to Summit, *Knopf* 325. RESURRECTION PLANT.

Phylum C. BRYOPHYTA.

MOSSES AND LIVERWORTS

Small plants, producing minute usually spherical bodies, called spores, in capsules, from which arise a protonema on which are borne the plants bearing archegonia and antheridia, from which the fruit is formed, these in turn bear spores.

There are two classes which differ from each other as follows:

Plants with a leafy, never bilateral, axis or stem; leaves mostly costate; no elaters mixed with the spores; calyptra ruptured at the base and borne upward by the growing capsule as a cap or head

1. MUSCI

Plants either thalline or with a bilateral axis or stem; leaves always without costa; elaters mixed with the spores except in Ricciaceae; calyptra ruptured in the upper part by the growing capsule and remaining at base of the capsule or its pedicel

2. HEPATICAE

Class 1. MUSCI.*

MOSSES

Terrestrial, epiphytic, or rarely aquatic plants, showing two distinctly marked but closely connected and continuous phases of growth, or alternate generations, usually having stem, leaves and rhizoids but not true roots; stems arising from a more or less ephermal protonema, which originates from the spore, forming either a filamentous

* By R. S. Williams.

or thallose growth. Sexual organs borne either apically or laterally on the stem, usually in special buds; antheridia and archegonia on the same plant or on separate plants; antheridium containing ciliate sperms; archegonium a single egg, after the fertilization of which the embryo develops into the fruit, rupturing the walls of the archegonium in its growth; the upper part of the archegonium is carried up by the elongation of the pedicel, forming the calyptra, which in many mosses covers and protects the capsule while it is developing. Capsule usually with a central axis forming the columella, around which the spore-sac is developed, usually separated from the walls by air-spaces and chlorophyll-bearing tissue. Capsule splitting regularly by a lid or slits, or breaking irregularly; when regular, frequently developing teeth around the mouth, forming the peristome, which serves in protecting and scattering the spores.

Order 1. BRYALES.

Family 1. DICRANACEÆ.

1. DICRANELLA Schimp.

1. **D. rubra** (Huds.) Kindb. Eur. & N. Am. Bryin. 208 (1897).
Bryum rubrum Huds. Fl. Angl. 413 (1762).

Closely massed on a sharply inclined clay bank, under shade, banks of a rill in the narrow cleft of Gallagher's Canyon, March 25, 1920, *Millsp.* 4872.

Family 2. FISSIDENTACEÆ.

1. FISSIDENS Hedw.

1. **F. limbatus** Sull. Bot. Pac. R. R. Survey 4:185 pl. 1 (1856).

On soil in dense shade of low shrubs, Rock Falls Canyon, March 10, 1920; and in shade on sandy loam, Cherry Valley, March 17, 1920, *Millsp.* 4763, 4799.

Family 3. POTTIACEÆ.

1. BARBULA Hedw.

1. **B. artocarpa** Lesq. Trans. Am. Phil. Soc. 13:4 (1869).

One of the commoner species of the Island. On rocks, pebbles and disintegrating rock. In fruit January to April. Avalon Run, *Millsp.* 4513, 4730, *Knopf* 299 pt.; 377 pt.; Pebble Beach Canyon, *Millsp.* 4695, 4889; Rock Falls Canyon, *Millsp.* 4762; Descanso Canyon, *Millsp.* 4664, 4665; Hamilton Canyon, *Millsp.* 4902; the Wishbone, *Knopf* 328 pt.

2. *B. subfallax* C. M. Bot. Zeit. 20:338 (1862).

On soil, Cottonwood Canyon, April 30, 1922, *Knopf* 405; Middle Ranch Canyon, Apr. 16, 1922, *Knopf* 412.

3. *B. vinealis* Brid. Bryol. Univ. 1:830 (1826).

Without definite locality, *Kingman*.

2. *DESMATODON* Brid.

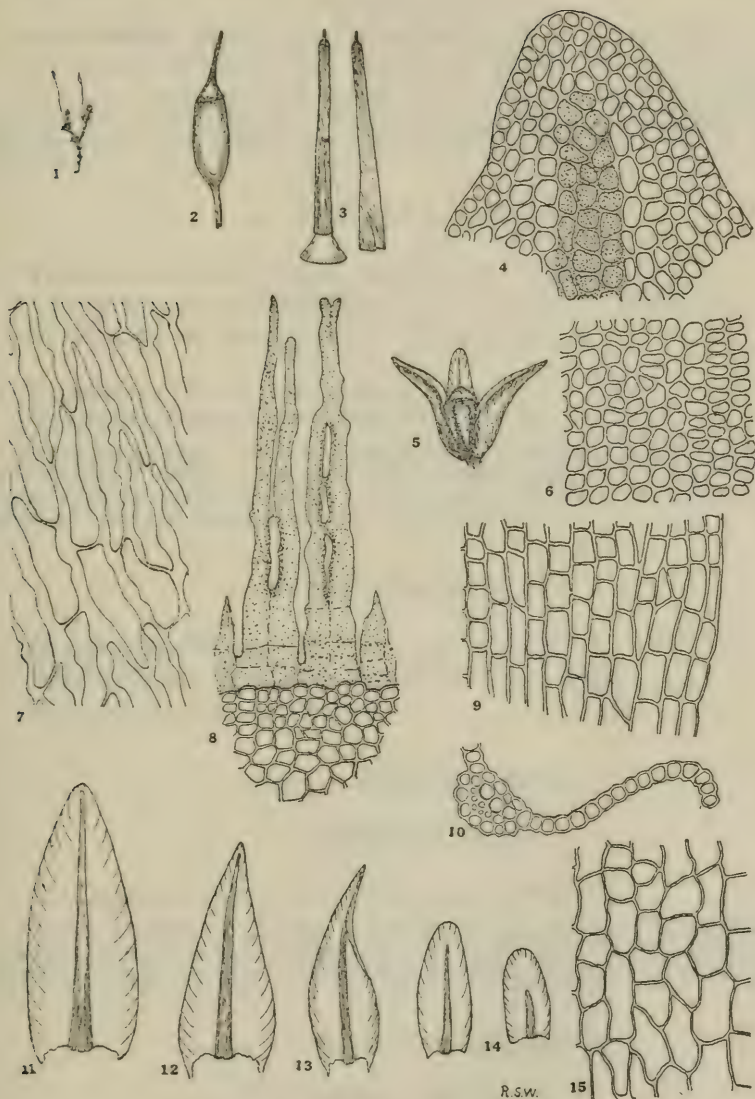
1. *D. Hendersoni* (R. & C.) Williams *comb. nov.* Plate XII
Didymodon Hendersoni Ren. & Card. Bot. Gaz. 15:151 pl. 5
(1890).

Dioecious, the male plants very similar to the fertile, with usually a single terminal flower, the 5 or 6 antheridia about one-third mm. long with few, inconspicuous paraphyses; plants in compact cushions with somewhat branching, slightly radiculose stems 10-12 mm. high, or sterile specimens occasionally 2-3 cm. high; stem-leaves incurved when dry, somewhat spreading and recurved when moist, the upper about 1.5 mm. long, becoming gradually smaller below, with obtuse or broadly acute apex, the margins entire and more or less recurved and decurrent at base; costa not quite percurrent, more or less rough on the back in upper part, in cross-section showing mostly 4 guide cells, one or two rows of large cells above them, and below, a stereid band enclosed by rather large outer cells; leaf-cells more or less mamilllose on both sides, those of upper part of leaf irregularly roundish or hexagonal, about 8μ in diameter, in basal part more or less rectangular, up to 30 by 8μ , the cell-walls all slightly thickened; seta smooth, 7-8 mm. long; capsule oblong-cylindric, erect, about 1 mm. long without the lid; median exothecal cells large, mostly a little elongate, with thin walls, the 4 or 5 rows of cells about the mouth smaller and slightly transversely elongate; stomata few, mostly in one row at the base of capsule; annulus none; peristome pale, densely papillose throughout, of 16 flat, irregular teeth, more or less divided or slit here and there along the median line, from a rather low basal membrane; lid conical, with a nearly erect, subulate beak mostly a little shorter than the capsule, the cells all in erect rows; calyptra subulate, descending only to the base of the beak, more or less slightly slit on one side, the elongate cells in oblique rows with thickened sinuous walls in the upper part; spores smooth, about 12μ in diameter.

On wet rock, Pebble Beach Canyon, February 7, 1920, *Mills* sp. 4691; on soil near the stream, Cottonwood Canyon, Apr. 30, 1922, *Knopf* 403.

2. *D. Guepinii* B. S. G. Bry. Eur. 18-20 (*Desmatodon* 8) (1843).

With *Asterella Palmeri*, Cottonwood Canyon, Apr. 30, 1922, *Knopf* 408a.



DESMATODON HENDERSONI (R. & C.) R. S. Will.

1. Plant about natural size.
2. Capsule $\times 10$.
3. Lid and calyptras $\times 12$.
4. Apex of stem-leaf $\times 275$.
5. Male flower $\times 12$.
6. Median cells of leaf $\times 275$.
7. Cells just above middle of calyptra $\times 275$.
8. Part of peristome and capsule $\times 180$.
9. Cells in basal part of leaf $\times 275$.
10. Cross-section of leaf about half-way down $\times 180$.
- 11-13. Upper, middle and lower stem-leaf $\times 25$.
14. Inner perichaetial leaves $\times 25$.
15. Median exothecal cells $\times 180$.

3. ALOINA Kindb.

1. **A. ericaefolia** (Neck.) Kindb. Laubm. Schwed. 137 (1883).
Bryum ericaefolium Neck. Act. Acad. Theod. pal. 2:45 (1770).

On a level sandy spot in an opening in the chaparral, Avalon Valley, February 3, 1920; and on open, flat, alluvium soil of a sheep pasture, White's Landing, January 13, 1920, *Millsp.* 4652, 4589; Middle Ranch Canyon, Apr. 16, 1922, *Knopf* 411.

4. TORTULA Hedw.

1. **T. atrovirens** (Sm.) Lindb. DeTort. 236 (1864).
Grimmia atrovirens Smith Eng. Bot. 28: pl. 2015 (1809).

On soil in Avalon Valley, February 13, 1922, *Knopf* 299.

2. **T. montana** (Nees) Lindb. Musc. Scand. 20 (1879).
Syntrichia montana Nees Flora 2 (pt. 1): 301 (1819).

On limestone rocks, summit of Mt. Martha, Gallagher's Canyon and Silver Canyon, March, *Millsp.* 4842, 4871, 4881; Avalon Valley in association with *Bryum californicum* (*Knopf* 326), and Hamilton Canyon, January 2, 1922, *Knopf* 307; Bulrush Canyon, Apr. 16, 1922, *Knopf* 407b.

5. DIDYMODON Hedw.

1. **D. tophaceus** (Brid.) Jur. Laub. 100 (1819).
Trichostomum tophaceum Brid. Mant. 84 (1819).

Near a calcareous spring, *Kingman*.

Family 4. GRIMMIACEÆ.

1. GRIMMIA Ehrh.

1. **G. trichophylla** Grev. Flora Edin. 235 (1824).

On the dry face of a rough conglomerate cliff, Swain's Canyon, White's Landing, January 13, 1920, *Millsp.* 4592; associated with *Tortula montana* on the top of a large limestone mass, Gallagher's Canyon, March 25, 1920. *Millsp.*

Family 5. ORTHOTRICHACEÆ.

1. ORTHOTRICHUM Hedw.

1. **O. Lyellii** Hook. & Tayl. Musc. Brit. 76, t. 22 (1818).

On limb of *Quercus tomentella*, Bulrush Canyon, Apr. 16, 1922, *Knopf* 407.

2. **O. cylindrocarpum** Lesq. Tr. Am. Phil. Soc. 13:6 (1863).

With the last, *Knopf* 407a.

Family 6. FUNARIACEÆ.

1. FUNARIA Schreb.

1. **F. hygrometrica** Sibth. Fl. Oxon. 288 (1794).

Mnium hygrometricum L. Sp. Pl. 1 (ed. 2) 1110 (1753).

On moist sand in exposed places, January to March. Avalon Valley, Rock Spring and Rock Falls Canyons, *Mills* sp. 4512, 4645, 4708, 4710, 4764; Chicken Johnny's Canyon, *Knopf* 327.

2. **F. mediterranea**. Lindb. Öfv. Vet. Ak. Förh. 20:399 (1863).

Thinly deposited on the down-side of a dry boulder, Pebble Beach Canyon, March 28, 1920, *Mills* sp. 4889a; Grand Canyon, Apr. 30, 1922, *Knopf* 409a.

Family 7. BRYACEÆ.

1. BRYUM Dill.

1. **B. argenteum lanatum** (P. Beauv.) B. S. & G. Bryol Eur. 4: (Bryum) 78. (1839).

Mnium lanatum P. Beauv. Prodr. 75 (1805).

On dry soil of a chaparral opening, Golf Links Canyon, January 29, 1920, *Mills* sp. 4644.

2. **B. californicum** Sull. Bot. Pac. R. R. Survey 4:186 pl. 6 (1856).

On level sandy soil, Avalon Canyon, January to February, *Mills* sp. 4646; *Knopf* 326.

3. **B. intermedium** (Ludw.) Brid. Mant. Musc. 120 (1819).

Mnium intermedium Ludw. Moos. Cent. 1. no. 81 (1802).

On a steep, grassy bank with northerly exposure. Pebble Beach Canyon, February 7, 1920, *Mills* sp. 4694.

4. **B. torquescens**. B. & G. Bry. Eur. 4: (Bryum) 49. pl. 20 (1839).

In soil of the roadside at the Wishbone near the spring, March 18, 1922, *Knopf* 328.

5. **B. obconicum** Hornsch. B. S. G. Bry. Eur. 6-9 (Bryum 59) (1839).

Without definite locality, *Kingman*.

Family 8. **LEUCODONTACEÆ.**

1. **ALSIA** Sull.

1. **A. Californica** (Hook. & Arn.) Sull. Proc. Am. Acad. 3:185 (1854).
Neckera Californica Hook. & Arn. Beechey's Voy. 162 (1841).
On trees and rocks, Gallagher's Canyon, December 11, 1920, *Nuttall* 969.

2. **ANTITRICHIA** Brid.

1. **A. californica** Sull. Trans. Am. Phil. Soc. 13:11 (1863).
On limb of *Quercus tomentella*, Bulrush Canyon, Apr. 16, 1922, *Knopf* 407d.

Family 9. **LESKEACEÆ.**

1. **CLAOPODIUM** Lesq. & James.

1. **C. leuconeuron** (Sull. & Lesq.) Ren. & Card. Rev. Bryol. 20:16 (1893).
Hypnum leuconeuron Sull & Lesq. Musc. Bor. Am. ed. 2:68 (1865).
Middle Ranch Canyon, Apr. 16, 1922, *Knopf* 413.

Family 10. **BRACHYTHECIACEÆ.**

1. **CAMPTOTHECIUM** Bry. Eur.

1. **C. arenarium** (Lesq.) Jacq. Ber. St. Gal. Nat. Ger. (1876-77): 380 (1878).
Hypnum arenarium Lesq. Trans. Am. Phil. Soc. 13:13 (1869).
On an earth bank, in perpetual shade, beyond Chicken Johnny's, January 6, 1920, *Mills* 4548; on damp, shady bank, Pebble Beach Canyon, January 15, 1921, *Nuttall* 1022.
2. **C. dolosum** Ren. & Gard. Hedwigia 32:336 (1893).
On an earth bank in perpetual shade, Avalon Valley, January 6, 1920, *Mills* 4548; on soil, Descanso Canyon, February 24, 1922, *Knopf* 292; on limbs of *Quercus tomentella*, Bulrush Canyon, Apr. 16, 1922, *Knopf* 407c.

2. **SCLEROPodium** Bryol. Eur.

1. **S. californicum** (Lesq.) Ren. & Card. Rev. Bryol. 20:20 (1893).
Hypnum californicum Lesq. Trans. Am. Phil. Soc. 13:13 (1869).

On a wet, grassy bank, Swain's Canyon, January 13, 1920, *Mills* sp. 4593a.

2. **S. illecebrum** (Vaill. Schw.) Br. & Sch. Bryol. Eur. 6: (Scleropodium) 3. pl. 2 (557) (1853).

Hypnum illecebrum Vaill. Schwaegr. Suppl. 1, pt. 2:255 (1816).

One of the commoner mosses of the island. On damp soil and roots of trees. Pebble Beach Canyon, Rattle Snake Canyon and Swain's Canyon, January to March, *Mills* sp. 4593, 4692, 4861; Big Wash Canyon and the Coach Road at the Wishbone and Summit, *Knopf* 283, 284, 287, 294, 298.

Class 2. **HEPATICÆ**.*

LIVERWORTS.

Terrestrial, epiphytic, or rarely aquatic plants, showing a distinct alternation of generations, the gametophyte existing as an independent individual, the very different sporophyte partially or wholly parasitic on the gametophyte. Gametophyte dorsiventral, consisting of a thallus or more or less differentiated into stem and leaves, attached to the substratum by means of rhizoids (true roots none), growing by means of an apical cell. Sexual organs borne on the upper surface of the gametophyte or terminal on more or less differentiated branches. Fertilized egg developing directly into the sporophyte, the wall of the venter of the archegonium usually developing into a protective cover, or calyptra, which is not ruptured until the sporophyte is nearly mature. Sporophyte consisting of a capsule only or differentiated into a capsule (spore-bearing organ), a stalk or a growing region, and a foot (absorbing organ). Capsule consisting of a wall of sterile cells and a spore-sac, the latter sometimes with a median sterile portion (columnella), dehiscing irregularly or by means of a lid or of longitudinal splits; spore-sac containing spores only or spores and elaters, the latter consisting of sterile cells, often elongated and usually developing spiral bands of thickening on their walls.

Order 1. **MARCHANTIALES**.

Gametophyte a prostrate, strap-shaped, dorsiventral thallus, growing apically, branching dichotomously or from the ventral surface of the median portion, and showing a distinct differentiation into

*Determinations by Alexander W. Evans.

tissues, the green tissue usually with air-spaces. Ventral scales more or less distinct. Rhizoids of two kinds, the one with smooth walls, the other with interior peg-like papillae. Antheridia in deep depressions on the upper surface of the thallus, sometimes scattered, sometimes grouped together in more or less definite, sessile or stalked receptacles. Archegonia similar in position but, when borne on stalked receptacles (carpocephala), becoming displaced to the lower surface through intercalary growth. Sporophyte a capsule only or differentiated into capsule, stalk, and foot; elaters (or other sterile cells) usually present in the capsule.

Family 1. RICCIACEÆ.

RICCIA FAMILY

1. RICCIA Linn.

1. *R. catalinæ* Underw. Bot. Gaz. 19:275 (1894).

On wet soil in the bottom of a deep canyon, McClatchie 441, Sept. 15, 1893.

2. *R. trichocarpa* M. A. Howe, Bull. Torrey Club 25:184 pl. 337 (1898).

Golf links at Avalon, Kingman.

Family 2. MARCHANTIACEÆ.

1. TARGIONIA Linn.

1. *T. hypophylla* Linn. Sp. Plant. 1136 (1753).

On earth of a moist bank, Hamilton Canyon, January 30, 1921, Nuttall 1066; at the Wishbone, February 24, 1922, Knopf 286; Kingman; Grand Canyon, Knopf 409 p.p.; Cottonwood Canyon, Knopf 408 p.p.

2. ASTERELLA Pal.

1. *A. californica* (Hampe) Underw. Bot. Gaz. 20:60 (1895).

Fimbriaria californica Hampe, Aust. Hep. Bor. Am. 135 (1873)
nom. nuda. Underwood, Bull. Illinois State Lab. Nat. Hist.
2:41 (1884).

On moist, sandy or clayey soil, December to May, Avalon Valley, Millsp. 4511, 4653; Rock Spring Canyon and Middle Ranch Canyon, Millsp. 4709, 4575; Big Wash Canyon, Nuttall 1106, Knopf 285; Silver Canyon, Nuttall 277, Knopf 291.

2. **A. Palmeri** (Aust.) Underw. Bot. Gaz. 20:61 (1895).
Fimbriaria Palmeri Aust. Bull. Torrey Club 6:47 (1875).

In Cottonwood Canyon, *Knopf* 408. His collection at this locality includes a few plants of *Targionia hypophylla* and an occasional fragment of *Fossombronia longiseta*.

Order 2. JUNGERMANNIALES.

Gametophyte a prostrate, strap-shaped, dorsiventral thallus or more or less clearly differentiated into stem and leaves, showing slight tissue differentiation, destitute of air-spaces. Rhizoids all with smooth walls. Antheridia in deep depressions or superficial and usually protected by scales or leaves, sometimes scattered, sometimes grouped together in more or less definite receptacles or androecia. Archegonia superficial but usually more or less protected by scales or leaves. Sporophyte differentiated into capsule, stalk, and foot, the capsule splitting irregularly at maturity or more commonly into four equal valves; elaters always present.

Family 1. JUNGERMANNIACEÆ.

JUNGERMANNIA FAMILY

Plant body usually prostrate or ascending, dorsiventral, differentiated into stem and leaves; branches lateral or ventral; leaves normally in three longitudinal ranks, two dorsal or lateral and one ventral, those of the ventral rank (the underleaves) smaller than the others and sometimes absent altogether. Antheridia borne singly or in some groups in the axils of more or less specialized leaves, the perigonal bracts. Archegonia borne singly or in groups at the tips of branches, surrounded by specialized leaves, the perichaetial bracts and bracteoles. Perianth present in many genera, consisting of a cylindrical or prismatic tube open at the apex. Capsule spherical to cylindrical.

1. FOSSOMBRONIA Raddi.

1. **F. longiseta** Aust. Hep. Bor. Am. 118 (1873).
Androcryphia longiseta Aust. Proc. Acad. Nat. Sci. Phila.
 1869:228 (1869)

Cottonwood Canyon, *Knopf* 408. Fragmentary collection with *Asterella Palmeri* and *Targionia hypophylla*.

2. **FRULLANIA** Raddi.

1. **F. catalinæ** Evans, Trans. Connecticut Acad. 10: 11. pl. 4. (1897).
On rocks in a canyon, *McClatchie*, Sept. 8, 1893.

Order 3. **ANTHOCEROTALES.**

Gametophyte a prostrate dorsiventral thallus, varying from strap-shaped to circular, with very little cell-differentiation, destitute of air-spaces but sometimes developing intercellular spaces with mucilage; green cells with one or a few large flat chloroplasts, often with a single pyrenoid. Antheridia borne singly or in groups just below the upper surface of the thallus. Archegonia in irregular dorsal groups, imbedded, the tip of the neck alone projecting. Sporophyte differentiated into a broad foot and an elongated cylindrical capsule, the latter growing indefinitely by means of a basal embryonic region, splitting at maturity into two valves. Spores surrounding a central sterile structure, the columella, and interspersed with irregular, often multicellular elaters, with or without bands of thickening.

Family 1. **ANTHOCEROTACEÆ.**

ANTHOCEROS FAMILY.

Characters of the order.

1. **ANTHOCEROS** Linn.

1. **A. Pearsoni** M. A. Howe, Bull. Torrey Club 25: 8, pl. 322, 323 (1898).

No definite locality, "not rare," *Kingman*.

Phylum D. **THALLOPHYTA.**

FUNGI & LICHENES.

This group, for the purposes of this Flora, is arranged rather loosely. It is deemed best not to repeat published descriptions of the classes, orders, families or even genera and species, except in case of new or noteworthy forms, on account of the limited field work so far accomplished and the, therefore, inadequate covering of the fungus flora at this time.

The Museum and the authors are deeply indebted to the following specialists who have given much of their valuable time and experience to the identification of species collected, and often added interesting notes and observations. These collaborators are indicated after each species: Dr. J. C. Arthur, Dr. E. A. Burt, Dr. C. E. Fairman, Dr. C. G. Lloyd, Dr. Thos. H. Macbride, Dr. W. A. Murrill and Dr. F. J. Seaver.

Sub-class BASIDIOMYCETES.

MUSHROOMS AND TOADSTOOLS.

A group of fungi in which the spores are borne on the summit of basidia (enlarged cells arising from the hymenium).

Hymenium on the free exposed surface of the sporophore.

1. HYMENOMYCETE.

Hymenium enclosed, lining cavities formed within a peridium.

2. GASTROMYCETE.

Order I. HYMENOMYCETE.

Family I. THELEPHORACEÆ.

1. CORTICIUM Pers.

1. *C. colliculosum* B. & C. Grevillea 2:13 (1873). *teste* Burt.

On dead wood of a cultivated Eucalyptus. Avalon, May 20, 1920, *Nuttall* 402.

2. *C. serum* Pers. Syn. 580 (1801). *teste* Burt.

On *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 522b.

3. *C. arachnoideum* Berk. Outl. 273 (1860). *teste* Burt.

On dead leaves and twigs of *Heteromeles*, Pebble Beach Canyon, Feby. 10, 1921, *Nuttall* 1092.

2. PENIOPHORA Cooke.

1. *P. velutina* (DC.) Cooke, Grev. 8:21 (1879). *teste* Burt.

Thelephora velutina DC. Fl. Fr. 6:33 (1805).

On stems of *Crossosoma californicum*, Big Wash Canyon, July 21, 1920, *Nuttall* 889.

2. *P. Allesheri* Bres. Fung. Trid. 2:62 (1898). *teste* Burt.

Diffused on underside of a decorticated *Heteromeles* log, Grand Canyon, Jany. 30, 1921, *Nuttall* 1060.

3. HYMENOCHÆTE Lév.

1. *H. rubiginosa* (Dicks.) Lev. Ann. Sci. Nat. Bot. 3, 5:151 (1846).

teste Burt.

Helvella rubiginosa Dickson Fasc. Pl. Crypt. Brit. 1:20 (1875).

On the underside of dead limbs of *Sambucus glauca*, Pebble Beach Canyon,

July 3, 1920; on oak, Gallagher's Canyon, Sept. 15, 1920; and on *Rhamnus insularis*, Nolava Canyon, June 30, 1920, *Nuttall* 526, 868, 515.

2. **H. tabacina** (Sow.) Lév. Ann. Sc. Nat. 3, 5:152 (1846) *teste* Burt.
Auricularia tabacina Sowerb. t.25 (1798)

On dead, hard wood of *Lyonothamnus floribundus*. Isthmus, July 28, 1920, *Nuttall* 644.

4. STEREUM Pers.

1. **S. gansapatum** Fr. Hym. Eur. 638 (1874). *teste* Burt.

On bark of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 15, 1920, *Nuttall* 883.

2. **S. heterosporum** Burt Theleph. N. Am. 12:220 (1920). *teste* Burt.

On dead twigs of *Encelia californica*, Isthmus, Aug. 30, 1920, *Nuttall* 825; on bark of *Crossosoma californicum*, Big Wash Canyon, July 21, 1920, *Nuttall* 889b; on bark of *Laurocerasus Lyoni*, Nolava Canyon, June 30, 1920, *Nuttall* 516; on dead wood of a cultivated *Eucalyptus*, Avalon, May 20, 1920, *Nuttall* 402b; on bark of *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920; *Nuttall* 777; on decorticated *Eucalyptus* log, Big Wash Canyon, Jany. 29, 1921, *Nuttall* 1047.

3. **S. hirsutum** (Willd.) Fr. Epicr. 549 (1838). *teste* Burt.
Thelephora hirsuta Willd. Fl. Ber. 397 (1787).

On bark of oak, Avalon, June 16, 1920, May 28, 1920, *Nuttall* 395, 397, 398; same, Gallagher's Canyon, *Nuttall* 869; on bark of *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920, *Nuttall* 778; on decorticated wood of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 15, 1920, *Nuttall* 883b; on *Quercus dumosa*, near base of Black Jack and on same in Hamilton Canyon, *Knopf* 304, 305; on dead *Heteromeles*, Pebble Beach Canyon, Feb. 10, 1921, *Nuttall* 1088.

4. **S. ochraceo-flavum** Schw. Rep. N. Y. Mus. 22:86 (1869) *teste* Burt.

On bark of *Nicotiana glauca*, Avalon, May 28, 1920, *Nuttall* 379.

5. CYPHELLA Fries.

1. **C. villosa** (Pers.) Karst. Mycol. Fenn. 3:325 (1876). *teste* Burt.
Peziza villosa Pers. Syn. Fung. 655 (1801)

On dead twigs of *Encelia californica*, Isthmus, Aug. 30, 1920, *Nuttall* 824b.

6. SOLENIA Hoffm.

1. **S. cinerea** Burt *sp. nov.*

The rather young fructifications are cespitose, 30-100 in a dense circular cluster, short stipitate, cylindric-clavate, or pyriform, pallid

neutral gray of Ridgway, minutely hairy, the apex obtuse and pore nearly closed; surface hairs colored, flexuous, $100 \times 3\frac{1}{2} \mu$, paler towards the tips and there granule-incrusted; basidia simple, $30 \times 6 \mu$, with 4 slender sterigmata; no mature spores found.

Clusters 2×2.5 mm; fructifications colored like those of *S. poraeformis* but with form of those of *S. anomala* and densely crowded together.

On bark of oak, Avalon, May 28, 1920, *Nuttall* 396.

Family 2. CLAVARIACEÆ.

1. CLAVARIA.

1. *C. flaccida* Fr.? Syst. Myc. 1:471 (1821). *teste* Burt.

On ground close to fallen limb of *Quercus tomentella*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1020, 1115.

Family 3. HYDNACEÆ.

1. GRANDINIA Fries.

1. *G. sp.* *teste* Burt.

On bark of *Photinia* (*Heteromeles*) *arbutifolia*, Avalon, May 28, 1920, *Nuttall* 380.

2. ODONTIA Fries.

1. *O. viridis* (A. & S.) Bres. Hym. Amet. 33 (1897). *teste* Burt.

On underside of fallen *Quercus tomentella*. Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1018.

"A pale green to deep-violet mould. Spores covering stones, twigs, leaves, earth, etc., under its growth".—*Nuttall*.

2. *O. sp.* *teste* Burt.

Juvenile. Effused, white, thin, aleutaceous, on bark of *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 523.

3. HYDNUM Linn.

1. *H. ohioense* Berk. Hook. Lond. Jour. Bot. 4:307 (1845). *teste* Burt.

Effused, white, toothed, becoming tan-color; on bark of *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 523.

2. **H. ochraceum** Pers. Syn. 559 (1801). *teste* Burt.

On bark of prostrate *Quercus tomentella*. Pebble Beach Canyon, Jany. and Feb., 1921, *Nuttall* 1011, 1027, 1090, 1101.

Family 4. POLYPORACEÆ.

1. MERULIUS Hall.

1. **M. confluens** Schw. Natur. Ges. Leipsig. Schrift. 1:92 (1822). *teste* Burt.

Effused. When young purplish base, light-brown when old. On oak, Pebble Beach Canyon, July 3, 1920, *Nuttall* 531; on dead twigs of *Encelia californica*, Isthmus; Aug. 30, 1920, *Nuttall* 824.

2. **M. pilosus** Burt. Mycolog. 14:84 (1922). *teste* Burt.

Distinguishing characters are the bright yellow color, presence of gloeocystidia and cystidia, and the minute spores; gloeocystidia have not been found in any other North American species of *Merulius* with the exception of *M. rugulosus* of the West Indies.

Apparently common on oak logs. On *Quercus tomentella*, Pebble Beach Canyon, Nov. 27, 1920, *Nuttall* 935; on oak, Big Wash Canyon, Nov. 29, 1920, *Nuttall* 951; on *Quercus tomentella*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1013, 1117; on oak, Big Wash Canyon, Jan. 14, 1921, *Nuttall* 1128.

2. PORIA Pers.

1. **P. incrustans** B. & C. Grevillea 1:54 (1873). *teste* Burt.

On bark of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 11, 1920, *Nuttall* 886.

2. **P. rhodella** Fr. Syst. Myc. 1:380 (1821). *teste* Burt.

Effused, thin, porous, white with distinctly wine-colored pores. On decorticated *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 527; on underside decorticated *Heteromeles*, Grand Canyon, Jan. 30, 1921, *Nuttall* 1056.

3. **P. vaporaria** Fr. Syst. Myc. 1:382 (1821). *teste* Burt.

On underside dead *Rhus laurina*, Big Wash Canyon, Nov. 29, 1920, *Nuttall* 949; and on earth, stones and wood in same locality, Nov. 26, 1920, *Nuttall* 917; on dead *Salix*, Hamilton Canyon, *Knopf* 306.

3. ELFVINGIA Karst.

1. **E. megaloma** (Lév.) Murr. Bull. Torr. 30:300 (1903). *teste* Murrill. *Polyporus megaloma* Lev. An. Sci. Nat. 3, 5:128 (1846).

On roots of a shrub, Piedra Escalera Canyon, Dec. 12, 1920, *Nuttall* 1141a.

4. FOMES Fries.

1. *F. igniarius* (L.) Fries. Syst. Myc. 1:375 (1821). *teste* Burt.
Boletus igniarius Linn. Sp. Pl. 1176 (1753).

On *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, and *Salix lasiolepis*, Grand Canyon, Sept. 19, 1920, *Nuttall* 529, 890.

2. *F. Abramsianus* Murrill, Mycologia 7:215 (1915). *teste* Burt.
On trunk of *Cercocarpus*, Bulrush Canyon, April 16, 1922, *Knopf* 410.

5. POLYSTICTUS Fries.

1. *P. hirsutus* (Wulf.) Fr. Nov. Symb. 83 (1851). *teste* Burt.
Boletus hirsutus Wulf. Jacq. Coll. 2:149 (1788) non Scop.

On trunk of oak, Avalon, May 17, 1920, *Nuttall* 458; Silver Canyon, Jan. 1, 1922, *Knopf* 289; on *Eucalyptus* log, Big Wash Canyon, Jan. 29, 1921 *Nuttall* 1049.

2. *P. versicolor* (L.) Fr. Syst. Myc. 1:369 (1821). *teste* Burt.

On trunk of oak, Avalon, May 14, 1920, and *Salix lasiolepis*, Silver Canyon, May 29, 1920, *Nuttall* 456, 457; on dead log, Hamilton Canyon, Jan. 16, 1921, *Nuttall* 1114.

Family 5. BOLETACEÆ.

1. BOLETUS (Dill) Linn.

1. *B. sp.* *teste* Murrill.

Pileus convex, 1 dm. broad, not viscid; color dull brick-red; flesh yellowish turning blue when cut, 2 cm. thick; tubes not decurrent, sinuses narrow, color greenish; pores red-orange; stem solid, 5 cm. long by 3 cm. thick covered with wavy or almost reticulate squamules yellowish at top. Rich wine-color at base.

In rich soil under trees. Big Wash Canyon, Nov. 29, 1920, *Nuttall* 945.

2. CERIOMYCES Corda.

1. *C. communis* (Bull.) Murr. Mycolog. 1:155 (1909). *teste* Murrill.
Boletus communis Bull. Hb. Fr. t. 393 (1788).

On ground, Beacon Street Canyon, Dec. 26, 1920, *Nuttall* 1120.

2. *C. sp.* (*prox C. edulis*). *teste* Murrill.

Under oaks, Big Wash Canyon, Dec. 10, 1920, *Nuttall* 1139.

Family 6. **AGARICACEÆ**.*

1. **TAPINIA** Karst.

1. **T. lamellosa** (Sow.) Murr. N.A.Fl. 10:146 (1917). *teste* Murrill.
Merulius lamellosus Sow. Eng. Fung. t. 403 (1809).

In moss of a creek-bed under willows, Grand Canyon, Dec. 27, 1920, *Nuttall* 928.

2. **MYCENA** Rouss.

1. **M. flava** Murrill, N. A. Fl. 10:192 (1917). *teste* Murrill.

Gregarious on sand of the creek-bed; on hillside under tree; and on ground under a tree, Golf Links Canyon, Hamilton Canyon, Big Wash Canyon, Nov. to Jan., *Nuttall* 1044, 1111, 1124.

3. **LEPTONIELLA** Earle.

1. **L. edulis** (Peck.) Murrill, N. A. Fl. 10:93 (1917). *teste* Murrill.
Leptonia edulis Peck, Bull. Torr. Club. 22:201 (1895).

In moss in rich leaf-mold and in leaf-mold among grasses, Pebble Beach Canyon, Sage and Big Wash Canyons, Nov. and Dec., 1920, *Nuttall* 928, 942, 1141.

4. **PLUTEUS** Fries.

1. **P. cervinus** (Schaeff.) Quél. Champ. Jura Vosg. 81 (1872). *teste* Murrill.
Agaricus cervinus Schaeff. Fung. Bavar. 4:Ind. 6 (1774).

On dead leaves under trees on a hillside, Big Wash Canyon, Nov. 29, 1920, *Nuttall* 1122.

5. **PLEUROTUS** Fr.

1. **P. ostreatus** (Jacq.) Fr. Syst. Myc. 1:182 (1821). *teste* Burt.
Agaricus ostreatus Jacq. Fl. Austr. 3:t 288 (1775).

On a cultivated Eucalyptus, Avalon, May 10, 1920, *Nuttall* 401; on dead Cottonwood, Silver Canyon, Jan. 15, 1922, *Knopf* 296.

*The co-author collected some 125 numbers of Agaricaceae between November, 1920, and January, 1921. Of each of these he made careful notes, section drawings and in many cases spore-prints. His material was, however, collected without proper facilities for drying; on this account over 50 per cent of the species prove indeterminable. His specimens are, however, preserved, in the herbarium of this Museum, in case of possible future collections to which they may prove referable.

2. *P. salignus* (Schrad.) Quél. Champ. 38 (1872). *teste* Burt.

On hole of a living *Laurocerasus Lyoni* tree, Silver Canyon, Jan. 15, 1922, Knopf 288.

3. *P. septicus* Fr. Syst. Myc. 1:192 (1821). *teste* Burt.

Inside loose bark of *Heteromeles*, Grand Canyon, Jan. 30, 1921, Nuttall 1064.

6. *RESUPINATUS* (Nees.) S. F. Gray.

1. *R. applicatus* (Batsch.) S. F. Gray, Nat. Arr. Brit. Pl. 1:617 (1821). *teste* Murrill.

Agaricus applicatus Batsch. Elench. Fung. Cont. 1:171 (1786).

Inside loose bark of a fallen *Photinia* (*Heteromeles*) *arbutifolia*, Grand Canyon, Jan. 30, 1921, Nuttall 1063.

7. *COPRINUS* Pers.

1. *C. sp.* *teste* Murrill.

Deep bell-shaped when young; pileus 1-1.5 cm. wide and high; caespitose, yellow-brown darker toward the center, brown, mealy, striate; margin scalloped. Expanded, 2 cm. broad. Gills silver-grey in young plants, black when old; stem white with slight pinkish tinge, hollow, finely striate above, white mealy dots above white pruinose below, woolly at base, cartilaginous but frail, easily bent, 1 dm. more or less long x 3.5-4 mm. thick.

In leaf-mold on a moss-covered rocky bank, Big Wash Canyon, Dec. 28, 1920, Nuttall 1003.

8. *LACTARIA* Pers.

1. *L. deceptiva* Peck. Ann. Rep. N. Y. State Mus. 38:175 (1884). *teste* Murrill.

In sand among pebbles of creek-bed, Big Wash Canyon, Dec. 10, 1920, Nuttall 955.

2. *L. scrobiculata* (Scop.) Fr. Epicr. Myc. 334 (1838). *teste* Murrill.
Agaricus scrobiculatus Scop. Fl. Carn. ed. 2, 2:450 (1772).

On creek bed in sandy soil among leaves, Hamilton Canyon, Jan. 16, 1921, Nuttall 1032.

9. *MARASMIUS* Fries.

1. *M. plicatulus* Peck, Bull. Torr. Club. 24:142 (1897). *teste* Murrill.

In grass under trees, Sage Canyon, Nov. 28, 1920, Nuttall 943; on mats of decayed oak leaves, Golf Links Canyon, Dec. 25, 1920, Nuttall 975.

2. **M. sp.**

teste Murrill.

A dry, tough plant; pileus convex with depressed margin and ribbed, 3-6 mm. broad, 1 mm. high; color pale tan; gills few, thick, alternately long and broad or narrow and short, sometimes the long are connected at the apex of the sinus and one lamella connects them with the stem, adnate, with a sinus about 13 broad and 13 narrow, color lighter than pileus; stem slender and tough, terete, nearly black, smooth and polished; pileus not easily detached.

Attached to leaves and acorns of *Quercus dumosa* under trees, Piedra Escalera Canyon, Dec. 12, 1920, *Nuttall* 967.

10. **HYPHOLOMA** Fries.

1. **H. fasciculare** (Huds.) Quél. Champ. Jura Vosg. 113 (1872).

teste Murrill.

On oak limbs among rocks in the creek bed Big Wash Canyon, Feb. 10, 1921, *Nuttall* 1093.

11. **STROPHARIA** Fries.

1. **S. æruginosa** (Curt.) Quél. Champ. Jura Vosg. 1:110 (1872).

teste Murrill.

Agaricus aeruginosus Curt. Lond. t. 309 (1784).

In damp, rich leaf-mold under *Laurocerasus Lyoni*, Sage Canyon, Nov. 28, 1920, *Nuttall* 937.

2. **S. semiglobata** (Batch.) Quél. *ibid.* 112 (1872). *teste* Murrill.

On ground among grass and dead leaves in a glade, Big Wash Canyon, Dec. 10, 1920, *Nuttall* 957.

12. **NAUCORIA** Fries.

1. **N. semiorbicularis** (Bull.) Quél. Champ. Jura Vosg. 100 (1872).

teste Murrill.

Agaricus semiorbicularis Bull. Champ. Fr. t. 442 f. l. (1788).

Exposed, dry ridges among cacti, Grand and Hamilton Canyons, Dec. 27, 1920, and Jan. 16, 1921, *Nuttall* 993, 1116.

13. **CLITOCYBE** (Fr.) Quél.

1. **C. sp.**

teste Murrill.

Pale cream colored, smooth, polished, slightly viscid, convex with incurved margin then irregularly applanate or depressed with incurved margin; flesh very thin, (3-6 cm.); gills decurrent, 5 cm. broad, pale watery cream color; stem solid, color of gills or pileus, flesh continuous,

tough dull or mealy, tapering downward or lower half terete; 0.6-1 dm. x 5-8 mm.

In leaf-mold in grass, Pebble Beach Canyon, Nov. 27, 1920, *Nuttall 926*.

2. **C. sp.** *teste* Murrill.

Solitary, spores white; pileus not viscid, white-cream color when old, slightly floccose and surface shallowly cracked, 3-8 cm. broad, generally somewhat eccentric, margin incurved, convex to applanate; flesh white, of very smooth close texture, continuous, thick (1 cm.) at stem; gills watery-white (white as viewed before cutting), 5-8 mm. broad, acute at outer end, decurrent on stem, 2-3 cm. long; stem large, white, fibrous, solid, often contorted, often slightly eccentric, some appearing as though white-washed, 8-15 cm. long x 8-16 mm. thick, white and solid inside and firmer to the touch than the flesh of the pileus (the flesh of this species appears as white and close-grained as unglazed white porcelain but is spongy to touch), the flesh extends to margin; pileus in age rich cream color or darker and rivulose.

In leaf-mold among rocks of a hillside under trees. Pebble Beach Canyon, Dec. 26, 1920, *Nuttall 982*.

3. **C. sp.** *teste* Murrill.

In a deep bed of leaves under an oak. Big Wash Canyon, Dec. 28, 1920, *Nuttall 1103*.

14. **AGARICUS** Linn.

1. **A. campestris** Linn. Sp. Pl. 1173 (1753). *teste* Murrill.

In leaf-mold in grass; in an open grassy glade; and on ground, Pebble Beach Canyon, *Nuttall 925* (Nov. 26, 1920), *952* (Dec. 20, 1920), *1138* (Nov. 27, 1920).

2. **A. silvicola** Sacc. Syllog. 5:998 (1887). *teste* Murrill.

In leaf-mold among grasses and in leaf-mold under trees, Big Wash and Piedra Escalera Canyons, *Nuttall 953* (Dec. 20, 1920), *1214* (Dec. 12, 1920).

3. **A. sp.** *teste* Murrill.

Convex, slightly depressed, margin deflexed, edge ragged with remnants of veil, densely floccose; color wet, pale to white, flocci brownish giving color to surface, 2.5-6 cm. slightly viscid; flesh white, not continuous, 4-5 mm. at stem; gills at first pale wine-pink, then black, free, sinus abrupt, double convex, lengths various; stem cartilaginous outside, white fibrous, remnants of veil near base; color at first white then becoming rich dark wine-color showing through the fine white fibers of the outer coat, interior (dark wine-color extends inward half way to center) white at center with partial cavity, terete or enlarged upward; volva none; veil thick but fragile; skin thick, easily peeled.

On ground in grass in a hillside hollow opposite the Sawmill, Avalon Valley, Oct. 12, 1920, *Nuttall 962*.

15. **ARMILLARIA** Fries.

1. **A. putrida** (Scop.) Murr. N. A. Fl. 10:39 (1914). *teste* Murrill.
Agaricus putridus Scop. Fl. Carn. ed. 2, 2:420 (1772).

On dead oak partly covered with earth; on base of dead, standing *Sambucus glauca*; and on rich leaf-mold under trees, Big Wash Canyon, Avalon Valley and Beacon Street Canyon, *Nuttall* 915 (Nov. 26, 1920), 960 (Dec. 12, 1920), 1131 (Dec. 26, 1920); *Knopf* 310 *teste* Burt, as *A. mellea* (Vahl.) Quéf., *Champ.* 38 (1872).

16. **LEPIOTA** P. Browne.

1. **L. conspurcata** (Willd.) Morgan, Jour. Myc. 12:243 (1906).
teste Murrill.
Agaricus conspurcatus Willd. Prodr. Fl. Berl. 382 (1787).

On a grassy slope, Piedra Escalera Canyon, Dec. 12, 1920, *Nuttall* 944.

17. **TRICHOLOMA** Fr.

1. **T. collybiiforme** Murrill, Mycologia 5:223 (1913). Plate X. f. 2.
Melanolenca collybiiformis Murrill, *ibid.*, 216. *teste* Murrill.

Fairly plentiful in leaf-loam under Scrub Oaks, Big Wash Canyon, Feb. 27, 1922, *Knopf* 415.

Order 2. **GASTROMYCETE.**

Family 1. **LYCOPERDACEÆ.**

PUFF-BALL FAMILY

1. **LYCOPERDON** Fourn.

1. **L. gemmatum** Batsch, Elench. Fung. 147 (1783). *teste* Lloyd.

Not the usual plant but a globose, depauperate form. Beside the Equestrian Trail, alt. 800 feet, Nov. 28, 1920, *Nuttall* 939.

2. **L. pyriforme** Schaeff. Icon. t. 189 (1761). *teste* Lloyd.

On sterile ground of a path, Pacific Ridge, Nov. 27, 1920, *Nuttall* 932.

2. **CATASTOMA** Morg.

1. **C. circumcisum** (B. & C.) Morgan, Jour. Cinn. Soc. Nat. Hist. 14:t.5. (1892). *teste* Lloyd.
Bovista circumcissa B. & C. N. A. Fung. 331 (1873), *Grevillea* 2:50 (1873).

Trask.

2. **C. subterraneum** (Peck.) Morgan, Jour. Cinn. Soc. Nat. Hist. 14:132 (1892). *teste* Lloyd.

Bovista subterranea Peck. Bot. Gaz. 4:216 (1879).

Trask.

3. BOVISTA Pers.

1. *B. plumbea* Pers. Syn. Fung. 137 (1801). *teste* Lloyd.
Trask; on a hard, grassy path, Big Wash Canyon, Feb. 9, 1921, *Nuttall 1081*.

4. GEASTER Micheli.

1. *G. floriformis* Vittad. Monogr. Lycoperd. 167 (1842). *teste* Lloyd.
Trask.
2. *G. fornicatus* (Huds.) Fries, Syst. Myc. 3: 12 (1829). *teste* Lloyd.
Lycoperdon fornicatus Huds. Fl. Angl. ed. 2: 644 (1788).

Trask; on ground under trees, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall 1133a*. Dr. Lloyd says: "A beautiful specimen, true to the species as known in England. A rare though widely distributed species. A common, but quite different, plant in pine woods has often been misnamed as this species." On earth of a hillside, Gallagher's Canyon, Dec. 11, 1920, *Nuttall 972*.

3. *G. hygrometricus giganteus* C. G. Lloyd, Myc. Notes 68. (1901).
teste Lloyd.

Trask; on a damp bank, Pebble Beach Canyon, Nov. 26, 1920, *Nuttall 919*; on earth of a hillside, Gallagher's Canyon, Dec. 11, 1920, *Nuttall 973*.

4. *G. limbatus* Fries. Syst. Myc. 3: 15 (1829). *teste* Lloyd.

Trask; on ground under trees, Big Wash Canyon, Nov. 29, 1920, *Nuttall 1133*. "Fine specimens"—Lloyd.

5. *G. minimus* Schw. Syn. Fung. Carol. 327 (1822). non Chev.
Trask. *teste* Lloyd.

6. *G. rufescens* Pers. Syn. Fung. 134 (1808). *teste* Lloyd.

Beside the Equestrian Trail, alt. 800 feet, Nov. 28, 1920, *Nuttall 938*. "The specimens represent a small form and rather suggest *G. fimbriatus* of Europe"—Lloyd.

5. CALVATIA Morgan.

1. *C. lilacina* (Mont. & Berk.) C. G. Lloyd, Lycop. Austral. 35 (1905). *teste* Lloyd.

Bovista lilacina Mont. & Berk. Berk. Dec. Fung. 59 (1854).

Mrs. Trask.

2. *C. pachyderma* (Peck.) Lloyd Let. 65: 14 (1917). *teste* Lloyd.
Lycoperdon pachyderma Peck, Bot. Gaz. 7: 54 (1882).

Trask; on ground on mountain top near Silver Canyon, May 2, 1920, *Nuttall 502, 503*. "Notwithstanding the different external surface appearance, different gleba color and different capillitium coloring of these two numbers I believe them to be different ages of the same species"—Lloyd.

6. **BATTARREA** Pers.

1. **B. Stevenii** (Libos.) Fr. Syst. Myc. 3:7 (1829). *teste* Lloyd.
Dendromyces Stevenii Libos. Monogr. t. 1, 2 (1814).

Mrs. Trask.

Order 3. **PHYLLOSTICTALES.**

Family 1. **PHYLLOSTICTACEÆ.**

1. **PHYLLOSTICTA** Pers.

1. **P. Heteromeles** Cook & Hark. Grev. 9:84 (1881). *teste* Fairman.

Associated with *Discosia poikilomera* on dead leaves of *Photinia* (*Heteromeles*) *arbutifolia*, May 28, 1920, *Nuttall* 381 pp.

2. **P. Laurocerasi** S. & S. Grev. 12:26 (1883). *teste* Fairman.

Pycnidia thickly scattered over the leaves, not on definite spots, globose, 100-122 μ in diam., black; spores oblong-cylindric, rounded at the ends, 10 $\times$ 3 μ , hyaline. Differs from the description of Ellis and Everhart in North American *Phyllostictas* in having pycnidia not on definite spots, and occasionally larger spores, thus agreeing better with the dimensions given by Saccardo.

On dead leaves of *Laurocerasus Lyoni*, July 31, 1920, Big Wash Canyon, *Nuttall* 668 pp.; on leaves of young shoots of same host, May 29, 1920, *Nuttall* 409. This last (409) has pycnidia clustered on whitened areas of the leaves and has spores 10-10.5 $\times$ 3 μ .

3. **P. maculans** E. & E.? Proc. Acad. Phila. 1893:157 (1893).

Pycnidia clustered or discrete, not on definite spots, minute, black; spores cylindric, hyaline, 10 $\times$ 2.5 μ . *teste* Fairman.

On dead leaves of *Populus trichocarpa*, May 13, 1920, *Nuttall* 385. The peculiar spotting of the leaves noted by Ellis and Everhart in the original description is not present in the California specimens but the spores agree so well that we refer it to this species. Accompanied by a *Pleospora* in small quantity with spores 5-7 septate, 35 $\times$ 14 μ , agreeing well with *Pleospora herbarum* (Pers.) Rabh.

4. **P. rhoiseda** Fairman *sp. nov.*

Pycnidia thickly scattered over the leaves, often discrete on the midrib or smaller veinlets, amphigenous, globose, at first deeply immersed in the substance of the leaves, becoming erumpent at first as minute black points, then pushing up through the epidermis at first elevated in light tobacco brown colored pustules which finally become split or variously lacerate, somewhat roughened at the apex, often covered or surrounded by small silvery scales of detached epidermis.

dull black, contents white, $165\text{--}400\ \mu$ in diam.: spores numerous, oblong-cylindric, rounded at the ends, hyaline, granular or with 2-3 small guttulae, $17.5\text{--}20 \times 3\text{--}3.5\ \mu$.

On fallen leaves of *Neostyphonia* (*Rhus*) *integrifolia*, May 31, 1920, *Nuttall* 389.

2. PHOMA (Fr.) Desm.

1. *P. eupyrena* Sacc.? Mich. 1:526 (1878). *teste* Fairman.

Apparently associated with *Phlyctaena arcuata* on dead stems of *Solanum Wallacei*, Big Wash Canyon, Feb. 9, 1921, *Nuttall* 1083 pp.

2. *P. Megarrhizæ* Fairman *sp. nov.*

Pycnidia immersed then finally erumpent and subsuperficial, mostly prevalent on the elevated margins of the longitudinal ribs of the stems, black, minute; spores ellipsoid, hyaline, about $3 \times 0.5\text{--}1\ \mu$.

On *Megarrhiza fabacea*, June 20, 1920, *Nuttall* 519 pp. We find it impossible to distinguish most of these small *Phomas*, except by host, as they look alike to us. As a matter of record this is given the provisional name above listed.

3. *P. nebulosa* (Pers.) Berk. Outl. 314 (1860). *teste* Fairman.

Apparently accompanying *Didymella superflua* on stems of *Urtica holosericea*, Middle Ranch Canyon, Sept. 21, 1920, *Nuttall* 901.

4. *P. typhicola* Oud. Ned; Kr. Arch. Ser. 3, 2:246 (1901).

Pycnidia thickly scattered, seated between the longitudinal ribs of the stem, erumpent, globose or ellipsoid, brown to black, measuring in the globose form $150\ \mu$ and upwards in diam., but when ellipsoid compressed $250\text{--}350\ \mu$ long and $100\text{--}130\ \mu$ in height: ostiola round, centrally located, at length widely open and causing the pycnidia to be more or less widely and irregularly perforate with age; spores ellipsoid, continuous, hyaline, $5\text{--}7.5 \times 2\text{--}2.5$ (possibly 3) μ . *teste* Fairman.

On *Typha latifolia*, Sept. 21, 1920, Middle Ranch Creek, *Nuttall* 899. Of the 4 or 5 species of *Phoma* on *Typha*, listed by Saccardo or Oudemans, Mr. Nuttall's specimens seem to come nearest to the above species.

3. PHOMOPSIS Sacc.

1. *P. Nicotianæ* Fairman *sp. nov.*

Pycnidia thickly scattered, immersed then erumpent, elevating the epidermis in minute pustules, the apex visible through the fissured epidermis and often enveloped by its fissured remains, black, $400\text{--}500\ \mu$ in diam., A-spores fusoid, continuous or 2 or more guttulate, hyaline, about $8\text{--}12 \times 2\text{--}3\ \mu$: B-spores filiform, sickle-shaped or curved at one end, hyaline, $14\text{--}20 \times 1\text{--}1.5\ \mu$, sporophores hamate, about the size and shape of the B-spores.

On bark of *Nicotiana glauca*, June 18, 1920, *Nuttall* 378 and May 27, 1920, *Nuttall* 374.

The *Diaporthe* with which this may be connected is unknown. Probably different in gross appearance from *Phomopsis Dulcumaræ* (Sacc.) Trav.

2. *P. oblita* Sacc. Ann. Mycol. 8: 343 (1910). *teste* Fairman.

Pycnidia corticolous, subepidermal, (apices erupting and visible as minute points), scattered, gregarious or seriate-confluent, depressed globose to ellipsoid, opening by a rounded central pore about $24\ \mu$ in diam. which is surrounded by a narrow black zone, dark brown, $150\text{--}500\ \mu$ in diam., A-spores numerous, fusoid, acute at the ends, continuous or with 2 or 3 small guttulae, hyaline, or greenish hyaline, $10\text{--}14 \times 2.5\text{--}3.5\ \mu$ (averaging $12.5 \times 2.5\ \mu$) borne on hyaline cylindric sporophores. B-spores not seen. Cfr. Diedicke, Ann. Mycol. IX: 26 and Saccardo, Ann. Mycol. VIII: 343.

On dead stems of *Artemisia heterophylla*, July 30, 1920, Creek Bed, Middle Ranch, *Nuttall* 666.

Associated in small quantity with a pyrenomycete which is compound, seated on a stroma formed of the unaltered substance of the plant stem, not circumscribed by any black line, asci cylindric, rounded at apex, sessile, $35\text{--}45 \times 14\ \mu$, 8-spored: sporidia ellipsoid, obtuse at the ends, 4-guttulate, $14 \times 5\ \mu$. This corresponds fairly well with *Diaporthe oblita* Sacc. & Speng.

4. *DOTHIORELLA* Sacc.

1. *D. Gallæ* (Schw.) E. & Starbæck, Bihang Sv. Vet. Akad. Handl. 19. 3: 2: 65 (1894). *teste* Fairman.
Sphaeria Gallæ Schw. Tr. Am. Phil. Soc. 2, 4: 207 (1832).

Stromata scattered, subepidermal becoming erumpent and raising the epidermis in pustules which become lacerate or variously cracked with age, rounded, oblong, or irregularly confluent, $500\ \mu$ and upward in length: spores fusoid, straight, curved or variously bent, hyaline, continuous, $7\text{--}12.5 \times 2\text{--}2.5\ \mu$, often surrounded by a zone of hyaline mucus.

On galls of *Quercus Macdonaldii*, June 14, 1920, *Nuttall* 400. We have seen no specimens of this and make the determination provisionally from Trotter's article on Gall Fungi in *Annales Mycologici* 3: 545.

5. *CYTOSPORA* Ehrenb.
(*CYTISPORA* Fr.)

1. *C. chrysosperma* (Pers.) Fr. Syst. Mycol. 2: 542 (1823).
Spores allantoid, hyaline, about $4\text{--}5 \times 1\text{--}1.5\ \mu$. *teste* Fairman.
On dead twigs of *Populus trichocarpa*, *Nuttall* 387.

2. *C. fugax* Fr.? Syst. Mycol. 2: 542 (1823). *teste* Fairman.

Stromata radiate-plurilocular subepidermal, disc without any special characters, opening by a central pore: spores hyaline, allantoid, curved, $4\text{--}5 \times 1\ \mu$, borne on long filiform sporophores.

On dead twigs of *Salix lasiolepis*, July 15, 1920, Grand Canyon, *Nuttall 630*. The perfect *Valsa* stage not seen and the identification is uncertain.

6. SPHÆROPSIS Lév.

1. *S. nebelina* Fairman *sp. nov.*

Pycnidia scattered, nestling in the inner bark, becoming erumpent, globose depressed, about $400\ \mu$ in diam., black: spores ellipsoid, almond shaped or pyriform, usually truncate attenuated at one end, obtusely rounded at the other, continuous, hyaline then brown, about $14-17.5 \times 7-8\ \mu$, borne on stout cylindric, hyaline sporophores, as long or a little longer than the spores.

Etymology *nebelina* from the resemblance in shape of the spores to the shell of *Nebela* a genus of the Rhizopoda.

On stems of *Galium angustifolium*, June 29, 1920, Golf Links Canyon, *Nuttall 520 pp.* *Socia Metasphaeria anisometra*.

7. CONIOTHYRIUM Corda.

1. *C. leprosum* Fairman *sp. nov.*

Pycnidia thickly scattered, at first immersed, then erumpent through the pustuliform elevated epidermis which becomes lacerate and covered by silvery scales of detached tissue, globose, black, $250-450\ \mu$ in diam.: spores numerous, ellipsoid, oval, ovoid or subpyriform, with a large gutta which follows the general shape of the spore, hyaline at first, becoming pale brown, $7-7.5 \times 3.5-5\ \mu$.

On fruits of cultivated *Eucalyptus*, June 3, 1920, *Nuttall 408*.

2. *C. Marrubii* Fairman. *sp. nov.*

Pycnidia scattered, immersed then erumpent, globose, black, $150-300\ \mu$ in diam.: spores numerous, globose, hyaline at first, then through smoky to black in color, $3-3.5\ \mu$ in diam.

On twigs of *Marrubium vulgare*, July 15, 1920, *Nuttall 613 pp.*

3. *C. olivaceum* Bon. Fekl. Symb. Myc. 377 (1869). *teste* Fairman.

Pycnidia scattered, immersed then erumpent, subconic to globose depressed, black, $140-275\ \mu$ in diam.: spores numerous, globose when young, becoming ellipsoid, subhyaline through yellowish hyaline to a very pale olivaceous brown, brown in mass, $2.5-6 \times 2.5-3.5\ \mu$.

On old stems of *Atriplex semibaccata*, *Nuttall 219b*.

8. DIPLODIA Fries.

1. *D. heteromelina* Fairman *sp. nov.*

Pycnidia immersed in the inner bark, becoming erumpent and raising the epidermis in distinct pustules at the apex of which the

ostiola protrude, globose, contents waxen white at first becoming obscure with age, $750-1000\mu$ in diam., black: sporophores hyaline, short, stout cylindric, 17.5μ in length: spores ellipsoid or at times subglobose, hyaline at first, later turning yellow, granular and provided with a large central gutta, finally becoming brown, uniseptate, not markedly constricted, in extreme age assuming an opaque appearance, when globose measuring $14-17.5\mu$ in diam., when ellipsoid $28-35 \times 14-17\mu$.

On dead twigs of *Heteromeles*, Jan. 30, 1921, Grand Canyon, *Nuttall 1068*.

The spores are larger than those of *Diplodia Crataegi* West which is found on near relatives of the host.

9. MICRODIPLODIA Sacc.

1. ***M. conigena*** Allescher. Rab. Krypt. Flora ed. 2, 7:79 (1903).

Pycnidia scattered, erumpent, globose or depressed-globose, black, $100-150\mu$ in diam.: spores ellipsoid, uniseptate, brown, $7-11 \times 4-6\mu$.
teste Fairman.

On cones of cultivated *Pinus*, Aug. 30, 1920, Isthmus, *Nuttall 823*.

2. ***M. Mimuli*** Fairman *sp. nov.*

Pycnidia discrete not in any definite spots, globose, centrally ostiolate, black, $150-165\mu$ in diam.: spores oblong-fusoid or ellipsoid attenuated at the ends, straight or curved, uniseptate, slightly constricted at the septum, brown $11-14 \times 6\mu$.

On leaves of *Mimulus cardinalis*, July 12, 1920, Big Wash Canyon, *Nuttall 606*.

3. ***M. Ramonæ*** Fairman *sp. nov.*

Pycnidia covered by the epidermis, becoming erumpent, depressed globose, of delicate submembranaceous texture, black, $200-250\mu$ in diam.: spores ellipsoid or turbinate, uniseptate, not markedly constricted, brown, $7.5-12.5 \times 4-5\mu$.

On twigs of *Ramona stachyoides*, July 15, 1920, on mountain side, Avalon, *Nuttall 614 pp.*, socia *Pleospora Labiatarum* Cke. and Hark., occurring in small quantity.

10. CAMAROSPORIUM Schulz.

1. ***C. eriocryptum*** Fairman *sp. nov.*

Pycnidia scattered or gregarious, subepidermal, becoming erumpent, covered by or sometimes protruding through the lanugo of the stems, globose depressed, dark chestnut brown under the microscope, black under the hand lens, often opening by a rounded pore, $200-$

225 μ in diam.: spores numerous, irregular in shape, globose, ellipsoid or obovoid, continuous at first, becoming transversely uniseptate (Diplodia form), then triseptate (Hendersonia form) the transverse septa running straight across the spores or variously curved and often diagonal, finally with one or more interrupted longitudinal septa, irregularly muriform or variously broken up, cracked or fissured, dark brown, becoming almost opaque, 10-14 x 7-8 μ (averaging about 12.5 x 7.5 μ).

On dead stems of *Audibertia Palmeri* Gray, Feb. 10, 1921, Avalon Creek bank, *Nuttall 1100*.

Somewhat smaller than *Camarosporium Compositarum* (Cke. and Hark.) Sacc. Associated with a small *Phoma*.

11. SEPTORIA Fries.

1. *S. Megarrhizæ* E. & E. Proc. Acad. Phila. 1894: 366.

Spots rounded or angular, intervenular, arid, pale, sometimes brown or greenish: pycnidia globose, black, 100-170 μ in diam., scattered irregularly over the spots: spores filiform, straight or curved, continuous, 40-65 x 2.5-3 μ . *teste Fairman.*

On leaves of *Megarrhiza fabacea* *Nuttall 460* and *1165*.

2. *S. rhabdocarpa* Ell. & Barth. Eryth. 4:25 (1896). *teste Fairman.*

Pycnidia amphigenous, thickly scattered, not on definite spots, area of growth not discolored, globose, centrally ostiolate, black, 100-300 μ in diam., spores oblong-cylindric, rounded at ends, sometimes subattenuated, continuous or minutely polar-guttulate, hyaline or greenish hyaline, 7.5-17.5 x 2-3 μ .

On dead leaves of *Salix lasiolepis*, Aug. 2, 1920, Willow Cove Canyon, *Nuttall 756*; on dead leaves of *Ramona polystachya*, July 10, 1920, Avalon Canyon, *Nuttall 548* (in this the pycnidia are often collapsing and the spores are 17.5-20 x 3.5 μ); on dead leaves of *Heteromeles arbutifolia*, *Nuttall 381 pp.*, 384 and 406. This agrees with specimens of *Septoria rhabdocarpa* on *Populus monilifera* from Rockport, Kansas, In Fung. Col. 668, the spores of which average 17.5-20 x 2.5-3 μ . We can see no essential difference between this and *Phoma baculum* Gerard which Grove transfers to the genus *Rhabdospora*. It is possible that it is simply a leaf form of Gerard's species. Found also on hickory nuts. Cfr. Fairman the Fungi of Our Common Nuts And Pits, p. 82 and plate 15, fig. 3, also Grove, Kew Bull. Misc. Inform. no. 4, 1919, p. 195, f. 17. Grove says, loc. cit., part III, 1921, p. 140: "It may be taken as a certainty that the idea, prevalent up to Saccardo's time, that the fungi found upon twigs or branches must be different from those found upon leaves, fruits and other parts of the same plants has little or no foundation; but it is true that those forms which occur on the less bulky structures like samarae are slighter in texture than those on the thicker parts."

3. *S. Rubi* West. Westand. Exs. 938 (1854). *teste Fairman.*

Spots small, circular, surrounded by a purplish border: pycnidia few, minute, dark brown: spores filiform, 28-32 μ in length, appearing guttulate or septate.

On leaves of *Rubus vitifolius* L., March 24, 1920, Big Wash Canyon, *Millsp.* 4856.

4. **S. Verbenæ** Rob. et Desm. Sylloge 3:537 (1884). *teste* Fairman.

On leaves of *Verbena prostrata*, Pebble Beach Canyon, June 5, 1920. *Nuttall* 505.

12. **PHLYCTÆNA** Mont. & Desm.

1. **P. arcuata** Berk. Grev. 2:100 (1873). *teste* Fairman.

On dead stems of *Solanum Wallacei*, Feb. 9, 1921, near the mouth of Big Wash Canyon, *Nuttall* 1083 pp. A *Phoma* is associated with the above which is probably *Phoma eupyrena* Sacc.

13. **SPHÆROGRAPHIUM** Sacc.

1. **S. avenaceum** Fairman *sp. nov.*

Perithecia scattered, globose, base flattened, beak stout, straight cylindric, obtuse or truncate and about 44μ wide at the apex, $75-80\mu$ in height (or practically one-third the height of the fungus), brown or black, 200μ in diam., and in height from the base to tip of the beak averaging about 200μ : spores clavate, with a long filiform or cilium-like tip at one end, at the other end subattenuate and obtuse, hyaline, often filled with a row of globose nuclei, $60-80 \times 2.5-3.5\mu$.

On dead leaves of *Avena barbata*, Sept. 11, 1920, Ridge above Reservoir, *Nuttall* 858.

Sparingly present. The spores stain beautifully in Erythrosine Glycerin. Number 858 is a much mixed thing, having, besides the above *Sphaerographium*, species of *Phoma*, *Puccinia*, *Macrosporium* and *Cladosporium*.

Family 2. **LEPOSTROMATACEÆ.**

1. **DISCOSIA** Lib.

1. **D. poikilomera** Fairman *sp. nov.*

Pycnidia scattered, depressed hemispherical, dimidiate, black, up to 500μ in diam.: spores oblong-cylindric, rounded and subattenuate at the ends, 4-septate, 2 septa in each end about $3-5\mu$ apart, leaving a large central cell a little more than twice the length of the end cells (or about $7.5-8\mu$), not constricted at the septa, hyaline to subhyaline, yellowish in mass, $17.5-20 \times 3.5\mu$, armed near each extremity with a curving filiform bristle about 7μ in length.

On dead leaves of *Photinia* (*Heteromeles*) *arbutifolia*, May 28, 1920, *Nuttall* 381 pp. and 383; on dead leaves of *Laurocerasus* *Lyoni*, July 31, 1920, Second Left Fork of Big Wash Canyon, *Nuttall* 668 pp. *Socia*, respectively, *Phyllosticta* *Heteromeles* and *Phyllosticta* *Laurocerasi*. The pycnidia leave a brown depression or cavity in the leaves when they are removed.

Order 4. HYPHOMYCETALES.

Family 1. MUCIDINACEÆ.

1. TRICHODERMA Pers.

1. *T. lignorum* (Tode.) Harz. Bull. Soc. Imp. Moscow 44, 1:116 (1871). *teste* Fairman.

On dead leaves of *Sambucus glauca*, on ground, under leaves, Pebble Beach Canyon, *Nuttall* 528.

2. SEPEDONIUM Link.

1. *S. chrysospermum* (Bull.) Fr. Syst. Myc. 3:438 (1829). *teste* Burt.
On a dead Agaric. Pebble Beach Canyon, Dec. 26, 1920, *Nuttall* 995.

Family 2. DEMATIACEÆ.

1. CERCOSPORA Fres.

1. *C. Ceanothi* Kell. & Sw. Jour. Myc. 4:94 (1888). *teste* Fairman.

On fallen leaves of *Ceanothus*, Hamilton Canyon, Jan. 16, 1921, *Nuttall* 1039. In this specimen the conidia are dark. We have followed Davis, Par. Fung. of Wisconsin, I, p. 86 in the determination.

2. *C. squalidula* Pk. 33rd. Rep. N.Y. St. Mus. 29 (1880). *teste* Fairman.
Cercospora rubigo Cke. & Hark. Grevillea 13:17 (1884).

On leaves of *Clematis ligusticifolia*, Nov. 21, 1921, Middle Ranch Canyon, *Knopf* 218.

2. CLADOSPORIUM Link.

1. *C. herbarum* (Pers.) Link. Mag. Ges. Naturf. Fr. Berlin 7:37 (1816). *teste* Fairman.

Spores hyaline, 1-3-septate, 14-20 x 7 μ . This may be the variety *fasciculare* Corda, a variety which we have never seen.

On stems of *Foeniculum vulgare*, Johnson's Landing, Sept. 24, 1920, *Nuttall* 911; on *Typha latifolia*, Middle Ranch Creek, Sept. 21, 1920, *Nuttall* 900; on capsules of *Isomeris*, Sept. 25, 1920, *Nuttall* 912 pp. The specimen on *Isomeris* is mixed, and there are found *C. herbarum* and a hyphomycetous fungus borne on stout rigid brown sporophores having oblong or fusoid-oblong conidia, usually 3-septate, occasionally with additional septa, brown, measuring about 20 x 7-10 μ , which is probably *Clasterosporium carpophilum* (Lev.) Aderhold; on transplanted Catalina Cherry Golf Links, Dec. 27, 1920, *Nuttall* 1000, *teste* Burt.

2. **C. herbarum** *forma* Fairman.

Hyphae brown, effused and much interwoven, sometimes collected in sori-like heaps, septate, about $7\ \mu$ in diam., varying in length; spores continuous or first becoming 1-2 septate, ellipsoid, hyaline then brown about $7\text{--}14 \times 5\ \mu$.

On *Lupinus Hallii*, Rusby, Aug. 17, 1915 (494111 in herb. Field).

3. **CLASTEROSPORIUM** Schw.

1. **C. carpophilum** (Lév.) Aderh? Centr. Bakt. 2, Abt. 7:656 (1901).

teste Fairman.

Helminthosporium carpophilum Lév. Ann. Sci. Nat. 2, 19:215 (1843).

Associated with *Cladosporium herbarum* on follicles of *Isomeris*, Sept. 25, 1920, Nuttall 912 pp.

Order 5. **USTILAGINALES.**

Family 1. **USTILAGINACEÆ.**

1. **USTILAGO** Pers.

1. **U. Lorentziana** Thüm. Flora 63:30 (1880). *teste* Arthur.

II II. On *Bromus Gussoni*, Pebble Beach, May 13, 1920, Nuttall 1900.

Order 6. **UREDINALES.**

Family 1. **MELAMPSORACEÆ.**

1. **KUEHNEOLA** Magn.

1. **K. uredinis** (Link.) Arthur. N. A. Fl. 7:186 (1912). *teste* Arthur.

II. On leaves of *Rubus vitifolius*, Big Wash Canyon, June 3, 1920, Nuttall 471.

Family 2. **UREDINACEÆ.**

1. **CRONARTIUM** Fries.

1. **C. Cerebrum** (Pk.) Schröt. Sacc. Michel. 2:308 (1881). *teste* Arth.
Peridermium Cerebrum Peck, Bull. Buffalo Soc. Nat. Sci. 1:68 (1873).

On last year's leaves of *Quercus dumosa*, Catalina Harbor, March 15, 1920, Mills. 4837.

2. MELAMPSORA Cast.

1. *M. monticola* Mains. Phytopath. 7:103 (1917). *teste* Arthur.
On leaves and pedicels of *Tithymalus leptocerus*, Avalon Valley, May 10, 1920, *Nuttall 1217*.

Family 3. ÆCIDIACEÆ.

1. PILEOLARIA Cast.

1. *P. Toxicodendri* (B. & R.) Arthur N. A. Fl. 7:147 (1907). *teste* Bartholomew.
Uromyces toxicodendri Berk. & Rav. Grevillea 3:56 (1874).
III. On *Toxicodendron* (*Rhus*) *diversilobum*, Avalon, July 19, 1915, *Mr. & Mrs. Elam Bartholomew 1515*.

2. UROMYCES Link.

1. *U. intricatus* Cooke. Grevillea 7:3 (1878). *teste* Arthur.
On leaves of *Eriogonum nudum*, sea cliffs east of Avalon, July 18, 1920, *Nuttall 618*.
2. *U. Junci* (Desm.) Tul. Ann.Sci. Nat. 4, 2:146 (1854). *teste* Bartholomew.
III. On *Juncus balticus*, vicinity of Avalon, July 19, 1915, *Elam Bartholomew 1788*.
3. *U. Loti* Blytt. Christ. Vid.-Selsk. Forh. 1896.6:37 (1896). *teste* Arthur.
II.? On leaves and bracts of *Syrmatium ornithopum*, Avalon Canyon, Feb. 18, 1920, *Mills 4723*; II. on same, Chicken Johnny's Canyon, June 20, 1920, *Nuttall 472*; on same, Avalon Canyon, June 6, 1920, *Nuttall 712*.
4. *U. medicaginis* Pass.Thum.Hb.Myc.Oec.156 (1874). *teste* Arth.
On leaves of *Medicago sativa*, roadside above the Sawmill in Avalon Valley, May 7, 1920, *Nuttall 711a*.
5. *U. Polygoni* (Pers.) Fekl. Jahr. Nass. Ver. Nat. 23-24:64 (1870). *teste* Bartholomew.
II, III. On *Polygonum aviculare*, vicinity of Avalon, July 19, 1915, *Elam Bartholomew 5888*.

3. DICÆOMA Nees.

1. *D. Nemoseridis* Fairman *sp. nov.*
O and I. Pycnia and aecia unknown.
II. Uredinia few, scattered, in oblong pustules, closely en-

braced or covered by the ruptured epidermis, brown, concolorous with the stems and discernable with difficulty: urediniospores broadly ellipsoid or globose, $20-30 \times 20-28 \mu$, golden brown at first, wall brown, smooth, possibly becoming faintly verrucose with age, 225μ in thickness, germ pores not satisfactorily made out.

III. Telia scattered, dark brown to black, ruptured epidermis evident, teliospores ellipsoid or oblong-ellipsoid, rounded above and below, at times narrowed below, constricted at the septum, $45.5-52.5 \times 28-35 \mu$: wall brown, 2.5μ thick, septum much darker and about 5μ wide, the pore of the upper cell subapical, the pore of the lower cell lateral and near the septum, apparently smooth or at least tardily roughened, pedicel short, subacute.

On stems of *Malacothrix*, in creek bed of Avalon Canyon, Feb. 9, 1921. Nuttall 1094 pp.

4. PUCCINIA Pers.

1. *P. Agropyri* E.&E. Jour. Myc. 7:131 (1892). teste Bartholomew.

III. On *Elymus condensatus*, vicinity of Avalon, July 19, 1915, Elam Bartholomew 5049.

2. *P. Clematidis* (DC.) Lagerh. Tromsö. Mus. Aarsh. 17:54 (1895). teste Arthur.

On culms and leaves of *Avena barbata*, vicinity of Avalon, June 1, 1920. Nuttall 413.

3. *P. Cressæ* (DC.) Lag. Bol. Soc. Brot. 7:131 (1889). teste Arthur.

I. On leaves of *Cressa truxillensis*, Catalina Harbor, March 15, 1920. Mills. 4790.

4. *P. Grindeliæ* Peck. Bot. Gaz. 4:127 (1879). teste Arthur.

On leaves of *Hazardia squarrosa*, Avalon, near the Reservoir, Sept. 11, 1920, Nuttall 846.

5. *P. Malvacearum* (Bertero) Mont. Gay, Hist. Chile 8:43 (1852). teste Fairman.

On *Malva parviflora*, March, 1901, Trask; III, on same, vicinity of Avalon, July 9, 1915, Elam Bartholomew 5886.

6. *P. Sherardiana* Körn Hedwigia 16:19 (1877). teste Arthur.

On leaves of *Malvastrum fasciculatum*, Gallagher's Canyon, May 16, 1920. Nuttall 412.

7. *P. Eriophylli* Jackson Mem. Brookl. Bot. Gard. 1:246 (1918).

Uredo abdita Jackson Mycologia 14:120 (1922). teste Arthur.

On *Eriophyllum Nevinii**, "Dusty Miller," cultivated in Banning's Lawn at Avalon, from nearby native stock, August, 1912, Bethel.

* Not *Senecio Cineraria* as given under *Uredo abdita* in Mycologia 14:120.

5. **PHRAGMIDIUM** Link.

1. **P. Rosæ-Californicæ** Diet. Hedw. 44:125 (1905). *teste* Bartholomew.
II, III. On *Rosa californica*, vicinity of Avalon, July 19, 1915, *Mr. and Mrs. Elam Bartholomew* 1823.

Order 7. **TREMELLINEALES.**

Family 1. **TREMELLACEÆ.**

1. **SEBACINA** Tul.

1. **S. calcea** (Pers.) Bres. Fungi Trident. 2:64 (1892). *teste* Burt.
Effused on bark of *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 522.
2. **S. podlachia** Bres. Ann. Myc. 1:117 (1903). *teste* Burt.
Gelatinous on decorticated wood of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 15, 1920, *Nuttall* 884.

2. **EXIDIA** Fries.

1. **E. glandulosa** (Bull.) Fries. Syst. Myc. 2:224 (1823). *teste* Burt.
On bark of oak, head of Gallagher's Canyon, Sept. 11, 1920, *Nuttall* 857.
2. **E. recisa** Fries. Syst. Myc. 2:223 (1823). *teste* Burt.
On bark of *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920, *Nuttall* 779.

3. **NÆMATELIA** Fries.

1. **N. nucleata** (Schw.) Fries. Epicr. 592 (1838). *teste* Burt.
On bark of *Sambucus glauca*, Pebble Beach Canyon, July 3, 1920, *Nuttall* 524; on dead *Quercus tomentella*, same locality, Jan. 15, 1920, *Nuttall* 1012.

4. **TREMELLA** Dill.

1. **T. lutescens** Pers. Ic. Descr. Fung. 33 (1809). *teste* Murrill.
On *Quercus tomentella*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1118.
2. **T. mesenterica** Retz. Vet. Ak. Handl. 1769:249 (1769). *teste* Burt.
Fries Syst. Myc. 2:214 (1823). On dead branches *Heteromeles*, Grand Canyon, Jan. 30, 1921, and on oak log, Pebble Beach Canyon, Nov. 27, 1920, *Nuttall* 1055, 933.

Order 8. **DACRYOMYCETINÆ.**

Family 1. **DACRYOMYCETACEÆ.**

1. **GUEPINIA** Friès.

1. **G. Peziza** Tul. Ann. Sci. Nat. Bot. 3, 19:224 (1853). *teste* Burt.
On dead wood of *Salix lasiolepis*, Grand Canyon, July 15, 1920, *Nuttall* 616.

2. **DACRYOMYCES** Nees.

1. **D. deliquescent** (Bull.) Duby, Bot. Gal. 2:729 (1829). *teste* Burt.
On *Eucalyptus* log, Big Wash Canyon, Jan. 19, 1921, *Nuttall* 1046.

Sub-class **MYXOMYCETES.**

FUNGI OF DECAYING VEGETABLE MATTER.

Order 1. **MYXOGASTERES.**

Family 1. **TRICHIACEÆ.**

1. **LYCOGALA** Micheli.

1. **L. Epidendrum** (L) Fries. Syst. Myc. 3:80 (1829). *teste* Lloyd.
Lycoperdon Epidendrum Linn. Sp. Pl. 1184 (1753).
On a rotten log, Big Wash Canyon, Nov. 26, 1920, *Nuttall* 1142.

2. **TRICHIA** Haller.

1. **T. fallax** Pers. Obs. 1:59 (1796). *teste* Macbride.
Plasmodium only. Crimson, effused; on dead leaves and twigs of *Salix lasiolepis*, Willow Cove Canyon, Aug. 2, 1920, *Nuttall* 757.

3. **ARCYRIA** Hill.

1. **A. nutans** Grev. Fl. Edin. 455 (1824). *teste* Burt.
On dead *Quercus dumosa*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1014.

4. **COMATRICHA** Preusz.

1. **C. nigra** Sch.? Cohn. Crypt. Fl. Schl. 3, 1:118 (1885) *teste* Burt.
On *Quercus tomentella*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall* 1016.

Family 2. **RETICULARIACEÆ.**

1. **RETICULARIA** Bull.

1. **R. Lycoperdon** Bull. Champ. Fr. 95 (1791-1812). *teste* Lloyd.
On top of a partly decorticated log of Eucalyptus, Big Wash Canyon, Jan. 29, 1921, *Nuttall 1048*.

Family 3. **PHYSARACEÆ.**

1. **CRATERIUM** Trent.

1. **C. leucocephalum** (Pers.) Rost. Mon. 123 (1875). *teste* Macbride.
Stemonitis leucocephala Pers. Gmel. Syst. 1:464 (1791).
On leaves of *Salix lasiolepis*, Willow Cove Canyon, Aug. 2, 1920, *Nuttall 755*.

2. **PHYSARUM** Pers.

1. **P. nutans** Pers. In Usteri Ann. Bot. 15:6 (1795). *teste* Burt.
On oak bark, Pebble Beach Canyon, Feb. 10, 1921, *Nuttall 1089b*, with the next.
2. **P. nutans leucophæum** Lister. Mycetozoa 67 (1911). *teste* Burt.
With the last on damp dead oak. Same location and date, *Nuttall 1089*.

Family 4. **STEMONITACEÆ.**

1. **STEMONITIS** Gledit.

1. **S. pallida** Wing. Macbr. N. A. Slime-moulds 123 (1899) *teste* Burt.
On *Quercus tomentella*, Pebble Beach Canyon, Jan. 15, 1921, *Nuttall 1015*.

Sub-class **PHYCOMYCETES.**

Order 1. **PERONOSPORINEÆ.**

Family 1. **PERONOSPORACEÆ.**

1. **PERONOSPORA** Corda.

1. **P. Hyoscyami** DeBy Ann. Soc. Nat. 4, 20:123 (1863). *teste* Fairm.
On leaves of *Nicotiana glauca*, Equestrian Trail, July 10, 1920, *Nuttall 544*.
Specimens of a blight on the same host were collected at San Diego by Prof. Farlow and referred to *P. Hyoscyami*. Others since that early date have called it *P. Nicotianae* Speg. For a consideration of the occurrence of this fungus in southern California consult Wilson, Studies in North American

Peronosporales, III, New or Noteworthy Species, in Bull. Torr. Bot. Cl. 1908. Cfr. "A dangerous Tobacco Disease appears in the United States." U. S. Dept. Agric., Department Circular number 174.—Fairman.

Sub-class DEUTEROMYCETES.

Order 1. HELVELLINEÆ.

Family 1. PEZIZACEÆ.

1. LAMPROSPORA Boud.

1. **L. Constellatio** (Berk. & Br.) Seaver, Mycologia 6:18 (1914).
teste Seaver.
Barlaea Constellatio B. & Br. Ann. Mag. Nat. Hist. IV. 17:142 (1876).

On a damp, shaded bank in Banning's Canyon, June 14, 1920, *Nuttall* 418.

2. LACHNEA Fries.

1. **L. umbrarum** (Fuck.) Gill, Disc. c. ic. (1879). *teste* Seaver.
Humaria umbrarum Fuck. Symb. 323 (1870).

On a damp, shaded bank in Banning's Canyon, June 14, 1920, *Nuttall* 419.

3. GEOPYXIS Pers.

1. **G. Catinus** Holmsk. Ot. 2:22 (1789). *teste* Seaver.

Under a dry, overhanging bank in Pebble Beach Canyon, May 19, 1920, *Nuttall* 420.

4. ORBILIA Fries.

1. **O. chrysocoma** (Bull.) Sacc. Syllog. 8:624 (1889). *teste* Seaver.
Calloria chrysocoma (Bull.) Fr. Summa 359

On rotten wood of *Sambucus glauca*, Pebble Beach Canyon, July 5, 1920. *Nuttall* 537.

5. HELOTIELLA Sacc.

1. **H. microspora** Burt, *sp. nov.*

Apothecia gregarious, sometimes cespitose in groups of two or three, primuline yellow of Ridgway, applanate, sessile, becoming 1 mm. in diameter, glabrous; exciple concolorous with the hymenium, prosenchymatous; asci 8-spored, cylindric, 75-80 μ long, p.sp. 45-50 x 3 μ ; paraphyses filiform; spores obliquely uniseriate, hyaline, even, unispertate, fusoid, 5-6 x 2-2½ μ .

On bark of rotting Photinia (Heteromeles) arbutifolia, Pebble Beach Canyon, February 10, 1921, *Nuttall 1087*. The small ascospores and asci are noteworthy.

6. DASYSCYPHA Fries.

1. *D. cerina* (Pers.) Fuck. Symb. 305 (1869-75). *teste* Burt.
Peziza cerina Persoon, Syn. 651 (1801).

On decorticated Heteromeles, Grand Canyon, Jan. 30, 1921, *Nuttall 1057*.

Family 2. CELIDIACEÆ.

1. AGYRIUM Fries.

1. *A. rufum* (Pers.) Fries. Syst. Myc. 2:232 (1823). *teste* Merrill.

On dead limbs of Lyonothamnus floribundus, Sept. 15, 1920, *Nuttall 870*.

Family 3. STICTIDACEÆ.

1. EMBOLUS Wallr.

1. *E. ochreateus* Sacc. Syllog. 8:832 (1889). *teste* Fairman.

Gregarious or scattered, 350μ and upward in height, stalked black; cups subhemispheric, disc plane or subconvex, 150μ and upward in diameter, provided with a long cylindric black stipe about 50μ in diameter and composed of densely interwoven tissues; asci cylindric, short stipitate, 8-spored, $45-58 \times 5\mu$, surrounded by numerous, matted, paraphyses: sporidia monostichous, ellipsoid, attenuated slightly at the ends, fuliginous at first, becoming brown or black. $7-7.5 \times 3-4\mu$.

On decorticated Heteromeles, Grand Canyon, Jan. 30, 1921, *Nuttall 1059*.

The spores resemble those of an Hypoxylon, and while some were found which seemed abnormal in length or thickness the dimensions given above are for the normal spores. Dr. C. L. Shear, who made a call upon the author (Fairman) at the time of the study of this species, took back to Washington a specimen and examined it carefully and compared it with the figure of this species in Fungi Italici. He says in confirmation: "Aside from this slight difference in spore measurements, I see no differences, and should be inclined to refer the specimens to this species, at least until there is an opportunity to compare authentic specimens of Embolus ochreateus with this material."

2. PHÆANGIUM Sacc. non Patouil.

1. *P. sphæroides* E.&E. (Phænangium) Bull. So. Calif. Acad. Sci. 4:62 (1905). *teste* Fairman.

Gregarious; apothecia round, black, smooth, globose at first, becoming depressed obconical with the disc plane or concave (convex

when moist), one-half to three-quarters mm. in diameter, the margin incurved when dry. Asci cylindrical, p-sp. $50-55 \times 4 \mu$. Paraphyses obscure. Sporidia uniseriate, oblong-elliptical, almost opaque, $6-8 \times 3-4 \mu$, resembling the sporidia of a Hypoxylon.

The name *Phaenangium* was first used by Saccardo as a sub-genus of *Cenangium*, embracing species with dark-colored spores. In Syll. 16:764, he gives *Phaenangium* generic rank. *Phaenangium* Patouillard is entirely different; see Syll. 11:442.

On bleached wood of *Rhamnus insularis* and of *Melosma* (*Rhus*) *laurina*, Avalon, March, 1904; *C. F. Baker* 4039, 4045; on *Comarostaphylos diversifolia* Greene, "Manzanita," on the main ridge between the main branches of Gallagher's Canyon, Sept. 11, 1920, *Nuttall* 859. Spores dark, $6-8 \times 3.5-4 \mu$.

3. PROPOLIS Fries.

1. *P. faginea* (Schrad.) Karst. Myc. Fen. 1:244 (1870). *teste* Fairman.

On *Laurocerasus Lyoni*, Nolava Canyon, June 30, 1920, *Nuttall* 617 pp., *socia* *Schizoxylon* q. v.

4. LECANIDION Rabh.

1. *L. atratum* (Hedw.) Rabh. Kryp. Fl. 1:342 (1863). *teste* Fairman.

In association with *Lophiosphaeria quercetri* on *Sambucus glauca*, Pebble Beach Canyon, July 2, 1920, *Nuttall* 510 pp.

5. SCHIZOXYLON Pers.

1. *S. insigne* (DeNot.) Bres. Rabh. Krypt. Fl. ed. 2, 1, 3:1253 (1863). *teste* Fairman.

On *Sericotheca* (*Spirea*) *franciscana*, Big Wash Canyon, Aug. 2, 1920, *Nuttall* 751; on *Laurocerasus Lyoni*, Nolava Canyon, June 30, 1920, *Nuttall* 517 pp.; on *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920, *Nuttall* 716.

6. STICTIS Pers.

1. *S. lanuginicincta* Fairman *sp. nov.*

Ascomata cup-shaped, immersed, surrounded by the matted lanugo of the stems, sometimes left free and exposed when the down disappears, margin white, entire or variously lacerate, disc whitish farinose at first, becoming dark with age, $400-500 \mu$ in diam.: asci 8-spored, clavate, cylindric, $100-115 \times 7-10 \mu$, surrounded by filiform paraphyses often exceeding the asci in length, and some times apically enlarged: sporidia hyaline, filiform, fasciculate, multiseptate, not readily separating into fragments, about as long as the asci.

On twigs of *Marrubium vulgare*, Avalon Canyon, July 15, 1920, *Nuttall* 613.

2. **S. radiata** (L.) Pers. Obs. Myc. 2:73 (1799). *teste* Burt.
On bark dead *Heteromeles*, Grand Canyon, Jan. 30, 1921, *Nuttall* 1058.

7. XYLOGRAMMA Wallr.

1. **X. nigerrima** (E.&E.) Rehm. Ann. Myc. 5:518 (1907). *teste* Fairm.
Briardia nigerrima E. & E. So. Calif. Acad. Sci. 4:62 (1905).

Apothecia gregarious, erumpent between the fibres of the bleached, weather-beaten wood, 1-4 mm. long, 1 mm. wide, black. Asci at first subglobose, then obovate-oblong, $40 \times 12-15 \mu$ 8-spored. Sporidia irregularly crowded, oblong-clavate, hyaline, becoming brown, guttulate, $8-12 \times 3-4 \mu$, continuous. Paraphyses branched above, and bearing a black epithecium composed of subglobose brown (becoming black) conidia, indistinctly submuriform, septate, $6-7 \mu$ in diameter.

On *Melosma* (*Rhus*) *Laurina*, Catholic Church gulley, March, 1904, *Baker* 4038.

Order 2. HYSTERIINEÆ.

Family 1. HYSTERIACEÆ.

1. GLONIOPSIS De Not.

1. **G. insignis** (Cke. & Hark.) Berl. & Vogl. in Sacc. Syll. Fung. 9:117 (1891). *teste* Burt.
Hysterographium insigne Cooke & Hark. *Grevillea* 14:10 (1875).

On dead wood of *Heteromeles*, Pebble Beach Canyon, Feb. 2, 1921, *Nuttall* 1097. This should be compared with the type—Burt.

2. GLONIUM Mühl.

1. **G. parvulum** (Ger.) Sacc. Syll. 2:735 (1883). *teste* Fairman.

Perithecia crowded, often subseriate on the blackened surface of the wood, subglobose when young becoming oblong, obtuse at the ends, with the apex longitudinally cleft and sometimes with faint striae parallel to the cleft, $500-1250 \mu$ in length, black: asci 8-spored, cylindric, short stipitate, about $60 \times 6-7 \mu$, surrounded by numerous filiform paraphyses exceeding the asci in length: sporidia uniseriate, oblong, rounded at the ends, uniseptate, constricted at the middle, hyaline often minutely guttulate, $7 \times 3-3.5 \mu$.

On dead dry wood of *Photinia* (*Heteromeles*) *arbutifolia*, Big Wash Canyon, July 24, 1920, *Nuttall* 634; also found on *Cercocarpus betulaeifolius*, Big Wash Canyon, July 21, 1920, *Nuttall* 626 pp.

2. *G. vestigiale* Fairman *sp. nov.*

Perithecia immersed then erumpent, scattered or gregarious, oblong, with a distinct longitudinal cleft, black, about $500-1000\mu$ in length; asci obovate, sessile or short stipitate, 8-spored, imbedded in a mass of slender paraphyses which exceed the asci in length: sporidia irregularly biseriata, ellipsoid, unequally uniseptate, constricted at the septum, hyaline or subhyaline, $24.5-30 \times 8-10\mu$.

On twigs of *Nicotiana glauca*, Avalon, June 7, 1920, *Nuttall* 377. The sporidia resemble the footprint of a modern shoe. It belongs in the group with spores which Rehm likened to *Arthonia* spores.

3. *HYSTEROGRAPHIUM* Corda.

1. *H. Bakeri* Earle ? Pl. Baker, 2:10 (1901). *teste* Fairman.

Hysterothecia crowded, erumpent superficial, oblong or ellipsoid, opening by a narrow longitudinal cleft, black, $500-1000\mu$ in length and 330μ in breadth: asci clavate-cylindric, short stipitate, rounded at the apex, $105-120 \times 14-17.5\mu$, octosporous, paraphysate: sporidia biseriata, ellipsoid to obovate, 5-7-septate, only slightly constricted at the septa, muriform, brown, $20-24 \times 6\mu$.

On a dead log of *Photinia* (*Heteromeles*) *arbutifolia*, Pebble Beach Canyon, Feb. 10, 1921, *Nuttall* 1097. *H. Mori* has spores uniseriate and deeply constricted. From *H. Kansense* sec. specimen in Wilson and Seaver's *Ascomycetes* the above is distinguished by smaller spores.

2. *H. Mori* (Schw.) Rehm. *Ascom.* 363 (1876). *teste* Fairman.
Hysterium Mori Schw. Tr. Am. Phil. Soc. 2, 4:244 (1832).

Hysterothecia scattered or gregarious, ellipsoid, erumpent-superficial, lips opening and exposing the disc, longitudinally striate, black 1-3 mm. long, one-half to one mm. wide: asci cylindric, 8-spored, paraphysate, $100-135 \times 12-14\mu$: sporidia uniseriate, ovate oblong, or ellipsoid, 3-5-septate, constricted at the middle, muriform, hyaline at first becoming brown, $15-25 \times 7-8\mu$.

On bare wood of *Lyonothamnus floribundus*, Isthmus, July 28, 1920, *Nuttall* 646 and 647; on bark and wood of *Cercocarpus betulaeifolius*, Big Wash Canyon, July 21, 1920, *Nuttall* 625. (625 is young and undeveloped); numbers 646 and 647 are accompanied by a lichen, in fact, the *Hysterographium* forms the smallest part of the collection.

3. *H. prominens* (Phil. & Hark.) Berl. & Vogl. Syll. Add. 270 (1886). *teste* Fairman.
Hysterium prominens Phil. & Hark. Bull. Calif. Acad. 1:125 (1884).

Hysterothecia superficial, oblong, opening by a longitudinal cleft which is more or less open, black, 1000μ or upward in length; asci octosporous, clavate-cylindric, $150 \times 25-27\mu$; sporidia biseriata

or irregularly biseriate, ellipsoid, rounded at the ends, 7-12-septate, strongly constricted at the middle, muriform, brown, $50-56 \times 14-17.5 \mu$.

On dead twigs of *Melosma* (*Rhus*) *laurina*, Avalon, June 13, 1920, *Nuttall* 391.

The specimens on *Rhus* agree well with Fung. Col. 529 on *Adenostoma fasciculatum* collected by McClatchie at Pasadena, California. The species is close to *H. vulvatum* Schw. from which it seems to differ in the spores not being unequally divided. The spores are described as broad fusoid but when one takes into consideration their length are narrow.

On dead wood of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 15, 1920, *Nuttall* 882. In the specimen on *Lyonothamnus* the asci are $160-170 \times 24-28 \mu$ and the sporidia are $70-84 \times 12-17.5 \mu$, the end cells lighter colored, the first and sometimes the second joint above the middle septum oedematous and reticulate muriform. A peculiarity of the spores which we have not seen mentioned is that they separate readily, outside the asci, upon pressure on the cover glass. It will also be noted that the spores of Mr. Nuttall's number 882 are larger than usually given for this species.

On *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920, *Nuttall* 775.

Associated with *Hypoxylon annulatum* on dead *Heteromeles arbutifolia*, Pebble Beach Canyon, Feb. 10, 1921, *Nuttall* 1169—*teste* Burt.

Order 3. PLECTASCINEÆ.

Family I. MYRIANGIACEÆ.

I. MYRANGIUM Mont. & Berk.

I. *M. catalinæ* Fairman *sp. nov.*

Stomata scattered, erumpent superficial, sometimes surrounded by the remains of the ruptured epidermis, varying in shape from convex-hemispheric or pulvinate-elevated to oblong-applanate; externally black-punctate and grayish-fibrillose, covered by thin, loosely-woven, flocculent or irregularly-fimbriate aggregations of brown, tortuous hyphæ, interiorly composed of pseudoparenchymatous tissue which is concolorous with, and shaded gradually into, the underlying wood cells and fibers of the host; $500-2000 \mu$ in length. Loculi peripheric, without visible ostiola, globose and $60-200 \mu$ in diameter or oblong and 160μ in length, the most superficial ones nearly surrounded by black, intercurrent fibers of the epistromatic layer, usually containing but one ascus to a loculus; asci broad cylindric or subglobose, sessile or with a short submastoid stipe, $70-90 \mu$ in diameter and up to 133μ in length, apophysate; sporidia irregularly tristichous or conglobate, ellipsoid, rounded at the ends, transversely 7-septate, unconstricted at the septa, muriform, hyaline, $40-50 \times 17.5-21 \mu$.

On stems of *Ramona* (*Audibertia*) *stachyoides*, June, 1920, *Nuttall* 415.

Order 4. PERISPORIALES.

Family 1. PERISPORIACEÆ.

1. CAPNODIUM Mont.

1. **C. Heteromeles** Cke. & Hark. Grev. 13:21 (1884). *teste* Fairman.

On leaves and branches of *Heteromeles arbutifolia*, May 28, 1920, *Nuttall* 382.

The specimen of 382 does not afford ripe ascospores and is possibly mixed with *Meliola Heteromeles* (Cke. & Hark.) Berl. et Voglino.

This "black smut" is very prevalent on *Heteromeles* throughout the island. I have seen no shrub or tree of the species without it and in many the leaves are absolutely black with it.—C. F. Millspaugh.

2. EUROTIIUM Link.

1. **E.** *teste* Thaxter.

On dead leaves of the Catalina Cherry, Summit, Dec. 27, 1920, *Nuttall* 1007; Hamilton Canyon, Jan. 16, 1921, *Nuttall* 1041.

Order 5. HYPOCREALES.

Family 1. NECTRIACEÆ.

1. NECTRIA Fries.

1. **N. episphæria** (Tode) Fr. Sum. V. Sc. 388 (1849). *teste* Fairman.

Perithecia episphæriaceous, superficial, blood red, often collapsing, quite variable in size; asci cylindric, octosporous, $70 \times 6-7 \mu$; spores irregularly uniseriate, broad fusoid, uniseptate, hyaline. $9-10.5 \times 4-5 \mu$.

On *Eutypella stellulata* (Fr.) Sacc., vicinity of Avalon, *Nuttall* 512 pp.

Family 2. HYPOMYCETACEÆ.

1. HYPOMYCES Fries.

1. **H. rosellus** (A. & S.) Tul. Ann. Soc. Nat. 4. 13:12 (1860). *teste* Burt.

On bark and decorticated wood of *Sambucus glauca*, July 5, 1920, *Nuttall* 541. The white- or cream-colored base stained wine-color by spores.

Order 6. DOTHIDEALES.

Family 1. DOTHIDEACEÆ.

1. PHYLLACHORA Nitsche.

1. **P. Nuttalliana** Fairman *sp. nov.*

Stromata scattered, oblong, the long diameter running parallel with the nerves of the leaves, slightly arched, 1-2 mm. in length,

dull black; loculi globose, about $200\ \mu$ in diam. asci cylindric, short stipitate, $84\text{--}88 \times 14\text{--}15\ \mu$, 8-spored; sporidia ellipsoid, uniseriate, at times mixed uniseriate and biseriate, hyaline, $11.5\text{--}15.5 \times 7\text{--}8\ \mu$.

Euryachora Aristidae and *Endodothella* Tracyi on same host are described as having uniseptate sporidia, but our species cannot be referred to either as the spores show no septation.

On leaves of *Distichlis maritima*, Little Harbor, Aug. 31, 1920, *Nuttall 821*.

Order 7. SPHAERIALES.

Family 1. SPHAERIACEÆ.

1. ROSELLINIA Ces. & DeNot.

1. *R. aquila* (Fr.) DeNot. Sfer. Ital. 21 (1863). *teste* Burt.

Large, brown, woolly mycelium on decorticated *Sambucus glauca*, Pebble Beach Canyon, July 5, 1920, *Nuttall 538*; on dead hard wood of *Quercus tomentella*, same locality, Jan. 15, 1921, *Nuttall 1026*.

Family 2. CERATOSTOMATACEÆ.

1. ACERBIA Sacc.

1. *A. bacillata* (Cooke) Berl. Ic. Fung. 2:142 (1899). *teste* Fairman.

Perithecia scattered, deeply immersed in the woody bark, often penetrating the wood, globose, thick walled, becoming suberumpent and elevating the epidermis which is colored gray, brown or black over and around them, with stout, roughened, irregularly sulcate necks and ostiola which finally protrude a short distance above the surface, black, $500\ \mu$ and upward in diam.; asci narrow cylindric, straight or curved, 6-8 spored, $200\text{--}300 \times 7\text{--}8\ \mu$, surrounded by a mass of indistinct filiform paraphyses; sporidia filiform, hyaline, yellowish in mass, fasciculate, multiseptate, indistinctly guttulate, about as long as the asci.

On dead stems of *Pentstemon cordifolius*, Avalon Canyon, July 18 and Sept. 2, 1920, *Nuttall 619, 827*.

Family 3. AMPHISPHAERIACEÆ.

1. STRIKERIA Körb.

1. *S. Catalinæ* Fairman *sp. nov.*

Perithecia immersed in bleached and whitened areas of the wood, becoming erumpent but with the base and a considerable portion sunk in the wood, at times scattered, usually subgregarious, compressed spherical or ellipsoid, dull black, 1-4 mm. in length, ostiola round or sub-compressed, not prominent but often inconspicuous, perforate with age: asci 8-spored, clavate-cylindric, stipi-

tate, rounded at the apex, surrounded by numerous filiform paraphyses, $100-125 \times 14 \mu$ (p. sp. $105 \times 14 \mu$); sporidia ellipsoid, rounded at the ends, triseptate not markedly constricted, one or more of the cells divided by a longitudinal septum, overlapping uniseriate or biseriata, brown when mature, $17.5-21 \times 10-12 \mu$.

On bare wood of *Lyonothamnus floribundus*, Gallagher's Canyon, Sept. 15, 1920, *Nuttall 871*. Associated with small quantities of patellariaceous and hysteriaceous fungi.

Sections show the perithecia in the wood substance to be more or less spheric, but in erupting through the hard, bare and weathered surface the latter become subject to so much pressure as to become molded into a narrowly compressed or ellipsoid form. The same conditions cause the ostiola at times to appear compressed, and the species is close to the border line between *Strickeria* and *Platystomum*. The peculiar, often confusing, external appearances of species of *Strickeria*, *Lophiostoma*, *Platystomum* and *Amphisphaeria* on dry, hard and bare wood in the Western United States is noteworthy. It is well exhibited in the Colorado collections of C. F. Baker as reviewed by Earle in *Plantae Bakerianae*, many of the types of which can be seen in the herbarium of the New York Botanical Garden.

2. TEICHOSPORELLA Sacc.

1. *T. lonicerina* Fairman *sp. nov.*

Perithecia sparsely scattered, immersed at first and covered by the blackened epidermis, becoming erumpent, base sunk in the matrix for approximately two-thirds the height, compressed spherical or oval, somewhat shining at the apex, otherwise dull black, slightly roughened and longitudinally striate, with minute, slightly protruding ostiola which are rounded or very rarely compressed and perforate with age; transverse sections in the wood tissue measuring $500-700 \mu$ while the superficial measurements of the fully erumpent fungus run in length from $500-2000 \mu$; asci clavate-cylindric, rounded at the apex, short stipitate, 8-spored, $115-175 \times 17.5-20 \mu$; paraphyses abundant; sporidia uniseriate, ellipsoid, 5-7-septate, not constricted, muriform or cribose guttulate, hyaline, subhyaline or yellowish with age, $20-31.5 \times 10-12 \mu$.

On dead stems of *Lonicera*, Avalon Canyon, July 18, 1920, *Nuttall 620*.

Family 4. LOPHIOSTOMACEÆ.

1. LOPHIOSPHERA Trev.

1. *L. querceti* (S. & Sp.) Sacc. Syllog. 2:676 (1883). *teste* Fairman.

On dead branches of *Sambucus glauca*, Pebble Beach Canyon, July 2, 1920, *Nuttall 509* and *510*.

Number 509 in its exposed, prominent and oval perithecia resembles many of the western species of the *Lophiostomataceæ*, found by Baker in Colorado and listed by Earle in *Plantae Bakerianae*. They assume this appearance on old, hard, dry or weathered bare wood. 510 is also, sparingly, the host of *Lecanidion atratum*.

Family 5. MYCOSPHÆRELLACEÆ.

1. MYCOSPHÆRELLA Johans.

1. *M. Chlorogalli* Fairman *sp. nov.*

Perithecia gregarious or thickly scattered, subepidermal becoming erumpent superficial, globose depressed, opening by a central rounded pore which is $7-10\ \mu$ in diam. and surrounded by a narrow black zone, black, $50-100\ \mu$ in diameter; asci 8-spored, broad ellipsoid, sessile or short stipitate, $55-60 \times 14-17.5\ \mu$, aparaphysate; sporidia irregularly tristicous, ellipsoid, rounded at the ends, hyaline or greenish hyaline, uniseptate at the middle, not constricted. $14-17.5 \times 5-7\ \mu$.

On dead stems of *Chlorogallum pomeridianum*, border of an old field, Middle Ranch, July 30, 1920, *Nuttall 665 pp.* *Socia Pleospora sp.*

2. *M. Clymenia* (Sac.)? Mich. 1:35 (Sphærella) (1879). *teste* Fairm.

Spots amphygenous, circular, sordid or pale brown, surrounded by a dark brown or purplish colored border; perithecia minute, thickly scattered, epiphyllous, globose or globose-depressed; asci clavate-cylindric, 8-spored, $40-50 \times 10\ \mu$, without paraphyses; sporidia biseriate, oblong clavate to ellipsoid, straight or curved, at first hyaline and continuous, apparently becoming uniseptate and unequally didymous, $10-12 \times 3-3.5\ \mu$.

On leaves of *Lonicera*, Big Wash Canyon, Feb. 10, 1921, *Nuttall 1084*. Accompanied by spermogonia which may be referable to *Phyllosticta vulgaris* *Lonicerae* Desm. The specimens are not mature and hence the diagnosis is uncertain.

3. *M. Nemoseridis* Fairman *sp. nov.*

Perithecia thickly scattered, erumpent, elevating the epidermis in pustules through the more or less blackened apices of which protrude minute papilliform ostiola, the ostiolum at times absent or deciduous and then the perithecia open by a central rounded pore, black, $100-150\ \mu$ in diam.; asci 8-spored, cylindric, saccate or obovate and capitate bulging at the upper third, short stipitate or sessile, rounded at the apex, $50-80 \times 14-17.5\ \mu$, aparaphysate; sporidia irregularly biseriate to conglobate tristicous, uniseptate at the middle, at times unequally didymous, ellipsoid, attenuated, but still obtuse at the ends, hyaline, often granular or guttulate, $17.5-21.5 \times 6-7\ \mu$.

On smaller branches of the stems of *Nemoseris* (*Rafinesquea*) *californica* creek bed of Avalon Canyon, Feb. 9, 1921, *Nuttall 1094 pp.*

The sporidia are beautifully differentiated by staining in Erythrosine Glycerine.

Family 6. PLEOSPORACEÆ.

1. PHYSALOSPORA Niesse.

1. *P. erratica* (C. & E.) Sacc. Syllog. 1:442 (1882). *teste* Fairman.

Asci clavate or ventricose pyriform, sessile or short stipitate, 6-spored, 70-87.5 x 20-24 μ , indistinctly paraphysate; sporidia ellipsoid, hyaline, granular, distichous or irregularly tristichous, 18-24 x 7-9 μ . Accompanied by a *Macrophoma*-like deuteromycete in pycnidia 110-220 μ in diameter containing hyaline ellipsoid spores 20-24 x 7 μ , and a *Phoma*.

On branches of *Nicotiana glauca*, May 20, 1920, *Nuttall* 372.

This cannot be separated morphologically from *P. erratica* by any differences at present known. *Physalospora Cydoniae* Arnaud described by Lex R. Hesler in Bull. Cornell Univ. Agric. Exp. Station no. 379 is probably the same thing. A great number of species of *Physalospora* have been described on wood and herbaceous stems which have hyaline, ellipsoid, spores measuring 15-25 x 7-10 μ which can be separated only according to habitat. Hesler has cultivated forms on *Malus*, *Hammamelis*, *Sambucus* and other hosts which he says are the same species. Cultures and inoculation experiments are necessary to determine whether the forms on herbaceous stems are the same as those on trees. For the present we refer the form on *Nicotiana* as above listed.

2. *P. eucalyptina* Fairman *sp. nov.*

Perithecia amphigenous, scattered or gregarious, immersed in the mesophyll which is sometimes distinctly yellow and concolorously tingeing the perithecia (and probably the spores) sometimes erumpent, but for the most part covered by the translucent epidermis, globose, 200-600 μ broad and up to 330 μ in height; asci 8-spored, cylindric, short stipitate, rounded at the apex, 100-125 x 10-11 μ , surrounded by filiform paraphyses; sporidia uniseriate, narrow ellipsoid, attenuated at the ends, granular, often minutely guttulate, hyaline to pale yellow, 14-17.5 x 7-10 μ .

On leaves of cultivated *Eucalyptus*, Avalon, June 3, 1920, *Nuttall* 405.

This seems to differ from any of the *Phyllachoras* described by Theissen and Sydow on this host in having smaller spores and no well defined stroma. The spores are not as obtusely rounded at the ends as those of *Physalospora aurantia* E. & E. which species it otherwise resembles.

3. *P. heteromelina* Fairman *sp. nov.*

Leaf spots irregular, whitish or grayish, limited by the veinlets, with a thin, narrow, reddish purple border which darkens with age; perithecia irregularly scattered over the spots, globose, black, with a large circular aperture at the apex, 200-225 μ in diam., at first subepidermal, becoming erumpent and surrounded by the lacerated leaf tissues; asci 8-spored, subcylindric, rounded at the apex, sessile or with a very short stipe, 50 x 7.5 μ , surrounded by granular or guttulate, cylindric paraphyses; sporidia obliquely 1-seriate, ellipsoid, hyaline or greenish hyaline, 7-10 x 3-4 μ .

On both living and dying leaves of *Photinia* (*Heteromeles*) *arbutifolia*, Avalon Canyon, Aug. 31, 1920, *Nuttall* 822.

Leaf sections show no clypeus and the species does not seem to be a *Phyllachora* to which genus Theissen and Sydow have referred many fungi originally described as *Physalosporas*.

2. DIDYMELLA Sacc.

1. *D. superflua* (Awd.) Sacc. Mich. 2: 316 (1882). *teste* Fairman.

Perithecia subepidermal becoming erumpent, scattered or gregarious, depressed globose to oblong, black, $200-250 \times 130-150 \mu$; asci clavate-cylindric, short stipitate, surrounded by indistinct paraphyses; sporidia uniseriate, oblong obovate, septate at the middle, slightly constricted at the septum, lower cell smaller, hyaline, $14 \times 6 \mu$.

On stems of *Urtica holosericea*, Middle Ranch Canyon, Sept. 21, 1920, *Nuttall* 901. Accompanied by a *Phoma* which may be *Phoma nebulosa* Auct.

2. *D. Ramonæ* Fairman *sp. nov.*

Perithecia scattered or gregarious, at first covered by the epidermis then erumpent, punctiform, submembranaceous, ostiola inconspicuous, black, $100-150 \mu$ in diameter; asci 8-spored, saccate or subventricose, rounded at both ends, subsessile, $20-35 \times 11.5-14 \mu$, surrounded by simple filiform paraphyses; sporidia biseriata, oblong ellipsoid, uniseptate or with the endochrome once divided at the middle, not constricted, hyaline or greenish hyaline, $10-14 \times 2-2.5 \mu$.

On twigs of *Ramona stachyoides*, on mountain side Avalon, July 15, 1920, *Nuttall* 614 *pp.* *Socia Pleospora Labiatarum* Cooke and Harkness.

3. DIDYMOSPHÆRIA Fuck.

1. *D. brunneola* Niessl. Oest. Bot. Zeit. 1874: 201. *teste* Fairman.

Perithecia scattered or gregarious, innate, becoming erumpent through the blackened and elevated epidermis, papilliform brownish black; asci 8-spored, clavate to subcylindric, stipe short, surrounded by numerous filiform paraphyses, $50-70 \times 10 \mu$; sporidia uniseriate, ellipsoid, slightly constricted, uniseptate, hyaline at first becoming olivaceous, $10 \times 3.5-4 \mu$. In exceptional cases the sporidia may reach 14μ in length. Smaller throughout than *Didymosphæria Catalinæ* E. & E.

On stems of *Pluchea camphorata* (L.) DC., Soapstone Quarry, Sept. 24, 1920, *Nuttall* 909.

2. *D. catalinæ* E. & E. So. Calif. Acad. Sci. 4: 63 (1905). *teste* Fairman.

Perithecia scattered on the bleached stems, raising the epidermis directly over them into little black pustules about one-half

mm. in diameter, mostly slightly compressed laterally; ostiola papilliform, minute, finally perforated. Asci cylindrical, short-stipitate, $90-100 \times 12 \mu$, with abundant paraphyses, slightly enlarged at the tips. Sporidia uniseriate, oblong, hyaline at first, becoming pale brown, uniseptate and constricted in the middle, $15-22 \times 6-7 \mu$.

On dead stems of *Artemisia californica*, Catholic Church gulley, March, 1905, *Baker 4041*.

4. AMPHISPHERIA Ces. & DeNot.

1. *A. dothideaspora* Cooke & Hark. Grev. 14:9 (1885). *teste* Fairm.

On dead stems of *Diplacus linearis* on a hillside in Cattail Canyon, July 10, 1920, *Nuttall 547*.

Specimens immature and only a few ripe ascospores found.

5. METASPHAERIA Sacc.

1. *M. anisometra* (C. & H.) Sacc. Syll. 2:163 (1883). *teste* Fairman.

Perithecia more or less thickly scattered, erumpent, ostiola just visible as papilliform points at the apices of the slightly pustuliform-elevated epidermis, subglobose flattened, black, $150-250 \mu$ in diam.; asci oblong-clavate, saccate or obovate, sessile or short stipitate, $40-70 \times 12-14 \mu$, surrounded by numerous filiform paraphyses much exceeding the asci in length and at times slightly enlarged at the apices; sporidia biseriate or conglobate, straight or slightly curved, fusoid to oblong ellipsoid, subacute or obtuse at the ends, 1-4-septate, unequally didymous, biconic at times, constricted at all the septa but most strongly so at the third septum, one part of the unequally divided spore broader and three septate, the smaller end uniseptate, hyaline, becoming darker in extreme age, $17.5-28 \times 4-8 \mu$.

This species occurs, in Southern California, on many hosts. A few sporidia were found on Mr. Nuttall's 520 which were brown, and Ellis & Everhart, in North Amer. Pyrenomycetes, say that "the mature sporidia are slightly olivaceous." In this condition it is a *Leptosphaeria*. On Mr. Nuttall's 520 some loose spores were found which looked like those of inverted *Leptosphaeria pulchra* (Winter) Sacc. and Berl. We leave it in *Metasphaeria* for it is usually found in the hyaline spored stage.

On stems of *Galium angustifolium*, Golf Links Canyon, June 29, 1920, *Nuttall 520*. Accompanied by a *Sphaeropsis* and a *Diplodia*. On twigs of *Nicotiana glauca*, May 19, 1920, *Nuttall 375*, spores $17.5-24 \times 7 \mu$. On twigs of *Rhus laurina*, May 20, 1920, *Nuttall 411*. Perithecia 125μ in diam.; spores $20 \times 7.5 \mu$, septate, unconstricted spores, $7-10.5 \times 3-4 \mu$. On twigs of cultivated *Eucalyptus*, June 3, 1920, *Nuttall 407*. Spores $17-20 \times 5 \mu$, socia *Phoma* sp. On dead stems of *Solanum Wallacei*, Big Wash Canyon, Feb. 9, 1921, *Nuttall 1083 pp.*, spores $20-24 \times 7 \mu$, socia *Phlyctaena arcuata* Berk. On dead twigs of *Baccharis viminea*, Sept. 17, 1920, Big Wash Canyon, *Nuttall 878*, spores $23.5 \times 7 \mu$. On dead stems of *Galium angustifolium*, steep Banks of Creek, Big Wash Canyon, Feb. 10, 1921, *Nuttall 1006*, spores $17-20 \times 7 \mu$; socia undeveloped *Leptosphaeria*. On a dead shrub, Big Wash Canyon, Jan. 29, 1921, *Nuttall 1074*, mostly young and

undeveloped; spores $17.5-20 \times 4-5 \mu$. On dead twigs of *Holodiscus ariaefolius*, left fork of Willow Cove Canyon, Aug. 2, 1920, *Nuttall 752 pp.*; spores $20 \times 6-7 \mu$; socia *Valsa holodiscina* q. v. On twigs of *Malvastrum Thurberi*, Cherry Canyon, July 1, 1920, *Nuttall 507*—teste Seaver.

6. LEPTOSPHERIA Ces. & DeNot.

1. *L. Galiorum gnaphaliana* Fairman *var. nov.*

Perithecia thickly scattered, not on definite spots, at first innate, then erumpent, with minute, protruding, conoid ostiola, often concealed beneath the woolly covering of the stems, sub-membranaceous, black, $150-200 \mu$ in diam.; asci, 8-spored, clavate-cylindric, short stipitate, $75-77 \times 10-12 \mu$; sporidia uniseriate or biseriate, straight, or curved, triseptate, constricted at the septa, guttulate, brown, $20-24 \times 7-7.5 \mu$.

On dead stems of *Gnaphalium*, Big Wash Canyon, Sept. 17, 1920, *Nuttall 879*. The spores are broader than those of *L. Doliolum* and the perithecia are smaller than those given in the description of *L. Galiorum* Sacc. which has spores of the same size and form. *Leptosphaeria Gnaphalii* (West and Fckl.) Sacc. is an imperfectly described and doubtful species, but it is said to have 5-septate spores. Berlese says, *Icones Fungorum* 88: "*L. Gnaphalii* (West & Fckl.) Sacc. incerta."

7. PLEOSPORA Rabh.

1. *P. Chlorogalli* Fairman *sp. nov.*

Perithecia depressed, oblong or ellipsoid, $350-500 \mu$ in length by $100-200 \mu$ in height, opening by a rounded, often excentric pore which is 60μ and upward in diam.; asci clavate-cylindric, short stipitate, $105-140 \times 20-24 \mu$, 8-spored; sporidia irregularly biseriate, oblong, 5-6-septate, muriform, brown, $25-35 \times 10-14 \mu$.

On dead stems of *Chlorogallum pomeridianum*, border of an old field, Middle Ranch, July 30, 1920, *Nuttall 665 pp.* The oblong, megastomous perithecia afford characters which distinguish this.

2. *P. herbarum* (Pers.) Rabh. *Herb. Myc. ed. 2: 547* (1857) *teste* Fairm.

Sporidia $28-35 \times 14-17 \mu$, 5.5-7 septate, brown.

On stems of *Verbena prostrata*, Pebble Beach Canyon, June 7, 1920, *Nuttall 506*. Accompanied by a *Phoma* which is probably a stage of the *Pleospora*. On *Foeniculum vulgare*, Johnson's Landing, Sept. 24, 1920, *Nuttall 910*. The above has perithecia $150-300 \mu$ in diam., asci clavate-cylindric, short stipitate, about $140 \times 35 \mu$ and spores 5-7 septate, muriform, brown, $30-38 \times 14 \mu$. On dead stems of *Cirsium occidentale*, Avalon Canyon, Jan. 29, 1921, *Nuttall 1069*. Sporidia $32-38 \times 14-17.5 \mu$ 7 septate, muriform, brown. On dead stems of *Ptiloria*, Avalon Canyon, Jan. 29, 1921, *Nuttall 1070* and *1071 pp.* Sporidia $27-32 \times 14-17 \mu$, 6-7 septate, muriform, brown. Probably a smaller spored form. Associated with an undeveloped *Metasphaeria* on oblong blackened or cloudy areas. On dead *Nemoseris* in Creek bed, Avalon Canyon, Feb. 9, 1921, *Nuttall 1094 pp.* Spores $30 \times 14 \mu$. On overwintered plants of some member of the *Fabaceae*, Big Wash Canyon, Jan. 29, 1921, *Nuttall 1075*.

3. *P. infectoria* Fekl. Symb. Myc. 132 (1869). *teste* Fairman.

Perithecia rather thickly scattered over the stems, centrally ostiolate, black, 250-350 μ in diam.; asci clavate, short stipitate, 8-spored, 112 x 20-24 μ ; sporidia uniseriate, or irregularly uniseriate, oval, mostly 5-septate, constricted at the middle, straw yellow becoming darker with age, about 31.5 x 14 μ .

On twigs of *Lupinus Hallii*, May 25, 1920, *Nuttall* 414.

Pleospora herbarum (Pers) Rabh. is often found on *Lupinus*, Cfr. Lindau, Hilfsbuch: Farlow, host Index: Earle, Plantae Baker. But the form on the above mentioned host from Santa Catalina differs markedly from specimens of *P. herbarum* on *Lupinus angustifolius* issued in Sydow's Myc. Germanica, no. 245. In spore dimensions they occupy middle ground between *P. herbarum* and *P. infectoria* and agree well with the description of *Pleospora Compositarum* Earle in Pl. Bak. Nuttall's 414 is also the host of a smaller *Pleospora* which has perithecia 100-150 μ in diam., asci clavate, short stipitate 45.5-59.5 x 7-10 μ and sporidia biseriate, brown, 14-17.5 x 6-7 μ , but the spores are not developed enough to be positive about the septa, either transverse or longitudinal, but possibly they may belong to *P. diaporthoides* E. & E. or *P. microspora* Sacc. There is also a *Phoma* on no. 414. Perithecia 165-198 μ in diam.: asci 105 x 24.5 μ : sporidia mostly 5-septate, 20-27 x 10 μ .

On *Typha latifolia*, June 6, 1920, *Nuttall* 140.

4. *P. Labiatarum* Cooke & Hark. Grev. 14:8 (1885). *teste* Fairman.

Perithecia black, 220 μ and upward in diam.; asci 8-spored, clavate-cylindric, 70-87.5 x 14-17.5 μ , sporidia biseriate, ellipsoid, 3-septate, constricted at the middle, with one or more of the cells longitudinally septate, yellow brown, becoming dark brown with age, 20-28 x 10-14 μ .

On twigs of *Ramona stachyoides*, Avalon, July 15, 1920, *Nuttall* 614, pp. The sporidia in Mr. Nuttall's specimens become darker than the color given in the original description, and are also 5-septate at times. *Socia Microdiplodia Ramonae* and *Didymella Ramonae*.

5. *P. Meliloti* Rabh. Fung. Eur. 2330 (1878). *teste* Fairman.

Perithecia thickly scattered, globose depressed, subcutaneous, erumpent, black, averaging about 335-350 μ in diam.; asci cylindric, short stipitate, rounded at the apex, 8-spored, 147-250 x 30 μ ; sporidia oblong-ovate, obliquely monostichous to irregularly distichous, 5-6 septate, muriform, at times cribose guttulate, honey brown, constricted at the middle, 30-38.5 x 14-17.5 μ .

On dead stems of *Melilotus* of previous season, Avalon Canyon, Jan. 29, 1921, *Nuttall* 1072, 1073. Ellis and Everhart in North Amer. Pyrenomycetes, list it as a syn. of *Pleospora herbarum*. Berlese in Ic. Fung. figures it as a distinct species.

Family 7. **VALSACEÆ.**

1. **ANTHOSTOMA** Nitschke.

1. *A. dryophilum* (Curr.) Sacc. Syll. 1:308 (1882). *teste* Fairman.
Sphaeria Diatrype dryophila Curr. Trans. Linn. Soc. 22:269 f. 75 (1858).

Stroma tuberculiform or irregularly coalescent, deeply immersed in the bark, then erumpent, with ostiola and necks converg-

ing in a roughened disc; asci cylindric, stipitate, paraphysate, p. sp. about 80μ in length; sporidia uniseriate, narrow ellipsoid, continuous, biguttulate at first, becoming brown or opaque. $10-11 \times 3.5-4\mu$.

On bark of *Quercus* sp., May 28, 1920, *Nuttall 399*.

2. VALSA Fries.

1. *V. Eucalypti* Cke. & Hark. *Grev. 9:85* (1881). *teste* Fairman.

Stromata discrete, sometimes thickly scattered, immersed in the inner bark, becoming erumpent and subsuperficial; perithecia few in a stroma, with stout, long ostiola which are straight or curved, somewhat roughened (smooth sec. Cooke), obtuse at the ends; asci clavate, sessile or short stipitate, $33.5-42 \times 6-7\mu$; sporidia hyaline, allantoid, straight or curved, $6-8 \times 1.5-2.5\mu$.

On dead bark of cultivated *Eucalyptus*, May 20, 1920, *Nuttall 403*.

The measurements of the asci are lacking in the original description, also in *Sacc. Syll. Fung.* and in *E. & E. North Amer. Pyrenomycetes*. The specimens of *E. & E.* in *N. Am. Fungi* were mainly in the stylospore stage.

2. *V. holodiscina* Fairman *sp. nov.*

Stromata orbicular, formed from the unchanged inner bark, with no black circumscribing line, finally elevating the bark in small, slightly raised pustules, scattered or gregarious; perithecia globose or angular from mutual pressure, circinate, black and shining, with short necks which converge in a slightly prominent black disc through which the shining black ostiola just protrude; asci clavate-cylindric, 8-spored, $30-35 \times 5-6\mu$, paraphysate: spores irregularly biserial, allantoid, curved, hyaline, $7.5-10 \times 2-2.5\mu$.

On dead twigs of *Holodiscus ariaefolius* (formerly *Spiraea ariaefolia*) left fork of Willow Cove Canyon, Aug. 2, 1920, *Nuttall 669 pp.* *Socia Metasphaeria anisometra* (C. & H.) *Sacc.* and a *Diaporthe* in a subepidermal valloid stroma without circumscribing lines and with hyaline, uniseptate, often quadriguttulate, unconstricted sporidia which measure $14-17.5 \times 3.5-4\mu$, agreeing well with *Diaporthe Fuckelii*, but the specimens are insufficiently developed to make the diagnosis sure. Through the kindness of Dr. Homer D. House, State Botanist of New York, we have had the privilege of examining the type specimens of Peck's *Valsa opulifoliae*, collected on *Spiraea opulifolia* at West Albany, New York, April 25, 1884. Mr. Nuttall's specimens on *Holodiscus* differ in absence of any gray disc, less prominent postules, and longer, spiny ostiola.

3. EUTYPELLA Nitsche.

1. *E. ceranata* Fairman *sp. nov.*

Stromata scattered or gregarious, disposed in parallel series in the longitudinal axis of the decorticated branches, on bare wood, immersed then erumpent and girt by the split fibres of the wood, oblong or narrow-ellipsoid, dull black, roughened, 1-6 mm. in length; perithecia monostichous, usually in a linear series lengthwise of the

stroma, 6-8 or more, at first immersed in a whitish waxy stroma which becomes brown or almost obsolete with age, with short cylindric ostiola which simply pierce the upper surface of the stroma and are visible as obtuse black tubercles on its surface; asci clavate-cylindric, long pedicellate, 8-spored, averaging about $70 \times 7 \mu$, paraphysate; sporidia allantoid, curved, irregularly biserial, hyaline to yellowish, $8-10 \times 2.5-3 \mu$.

On dead wood of *Photinia* (*Heteromeles*) *arbutifolia*, Big Wash Canyon, July 24, 1920, *Nuttall 632*.

2. ***E. domicalis*** Fairman *sp. nov.*

Stromata scattered or gregarious, convex, hemispherical with flattened base, dome-shaped rarely confluent and irregularly elongated, black, surrounded by a black circumscribing line, 1-4 mm. in length; perithecia globose, often irregular from pressure, thick walled, monostichous, from 2-30, in a stroma; ostiola long cylindric, either irregularly or in separate fascicles; asci 8-spored, clavate, long stipitate, p. sp. $35 \times 7 \mu$; sporidia biserial above, uniserial below, allantoid, curved, hyaline to yellowish, $10 \times 2.5 \mu$.

On *Adenostoma fasciculatum*, Equestrian Trail, Aug. 7, 1920, *Nuttall 774*.

3. ***E. Populi*** E. & E. Am. Nat. 1897: 342. *teste* Fairman.

On *Populus trichocarpa*, Avalon Canyon, July 15, 1920, *Nuttall 615*.

4. ***E. stellulata*** (Fr.) Sacc. Syllog. 1:571 (1882). *teste* Fairman.

Stromata erumpent through the bark in longitudinal clusters, formed from the unchanged substance of the inner bark, surrounded by a black circumscribing line, epidermis often inflated and pierced by the ostiola; perithecia variable in number, globose or angular from mutual pressure, pachypleurous; ostiola short, rugose; asci octo-sporous, clavate-oblong, long pedicellate, $50 \times 6-7 \mu$, paraphysate; sporidia subdistichous, allantoid, hyaline, often pale yellow when ejected in mass, $10-12 \times 2-2.5 \mu$.

On bark of the limbs of *Sambucus glauca*, Pebble Beach Canyon, July 5, 1920, *Nuttall 542*.

4. **EUTYPA** Tul.

1. ***E. lata*** (Pers.) Tul. Select. Fung. Carp. 2:56 (1863). *teste* Fairm.

Stroma widely effused, continuous, innate in the wood and bark, uneven, cinereous to brown or black; perithecia monostichous, immersed, somewhat protruding, globose, $225-325 \mu$ or upward in diam.; ostiola scattered, often irregularly, obtuse conical or sub-hemispheric, entire; asci cylindric-clavate, long pedicellate, p. sp. $33 \times 5-6 \mu$; sporidia biserial above, uniserial below, allantoid, straight or curved, yellowish hyaline, $7-10 \times 1.5-2 \mu$.

On dead wood and bark of *Crossosoma californica*, Avalon Canyon, July 21, 1920, *Nuttall* 629.

5. PERONEUTYPA Berl.

1. *P. heteracantha* (Sacc.) Berl. Ic. Fung. 3:81 (1902) *teste* Fairman.

On limbs of *Sambucus glauca*, Pebble Beach Canyon, July 5, 1920, *Nuttall* 539.

Family 8. MELOGRAMMATACEÆ.

1. BOTRYOSPHERIA Ces. & DeNot.

1. *B. sp.* *teste* Fairman.

On bark of *Nicotiana glauca*, May 7, 1920, *Nuttall* 376.

This specimen not fully matured, only a few ripe ascospores found which were ellipsoid, yellowish hyaline, often granular, $20 \times 8 \mu$ contained in clavate asci $70-85 \times 20-27 \mu$, paraphysate. Evidently in that composite called by Ellis and Everhart, in North Amer. *Pyrenomyces*, *Botryosphaeria fuliginosa* (M. & N.).

Family 9. XYLARIACEÆ.

1. NUMMULARIA Tul.

1. *N. Clypeus* (Schw.) Cooke. Grev. 12:6 (1883). *teste* Fairman

On small leaved *Quercus* (*dumosa*?), Pebble Beach Canyon, July 3, 1920, *Nuttall* 530.

Spores dark, continuous, $14 \times 6-7 \mu$.

2. HYPOXYLON Bull.

1. *H. botrys* Nitsch. Pyr. Germ. 34 (1867). *teste* Fairman.

Stromata erumpent, depressed tuberculiform and 4-5 mm. in diam., or elongated up to 10 mm. long, composed of simple aggregations of perithecia underlaid and also surrounded by the whitened substance of the bark or wood, black; perithecia monostichous, discrete or aggregated, imbedded in bark or wood, overlaid and cemented together by the thin crustose stromatic roof, projecting above the surface to a variable distance; asci 8-spored, cylindric, stipitate, $125 \times 7 \mu$ (p. sp. $70 \times 7 \mu$), sporidia uniseriate, narrow-ellipsoid, continuous, often guttulate, black, $10-12 \times 7 \mu$.

On *Lonicera catalinense*, *Nuttall* 781.

We have not seen authentic specimens of *H. botrys* and the determination follows the understanding of Ellis, in N. A. Pyr., of the characters of this species.

2. **H. rubiginosum** (Pers.) Fr. Sum. Veg. Scan. 384 (1849) *teste* Fairm.

On *Cercocarpus betulaeifolius*, Big Wash Canyon, July 21, 1920, *Nuttall* 626 pp. Asci p. sp. 70-80 x 7 μ , spores black, 8-10 x 4 μ . On *Heteromeles*, right fork of Gallagher's Canyon, Sept. 15, 1920, *Nuttall* 867. Young stage. On *Rhamnus insularis*, Nolava Canyon, June 30, 1920, *Nuttall* 512.—*teste* Seaver.

3. **H. annulatum** (Schw.) Mont. Syll. Crypt. 213 (1856). *teste* Burt.

On dead log of *Heteromeles arbutifolia*, Pebble Beach Canyon, Feb. 10, 1921, *Nuttall* 1091.

4. **H. atropurpureum** Fr. Summ. Veg. Scand. 384 (1849). *teste* Burt.

On dead log *Rhamnus*, Gallagher's Canyon, Dec. 11, 1920, *Nuttall* 1105.

5. **H. sp.** *teste* Fairman.

On *Adenostoma fasciculatum*, north hillside top of Willow Cove Canyon, Aug. 7, 1920, *Nuttall* 780.

Not in the Ellis Herbarium. Failing to recognize this Dr. Fairman sent it to Mr. C. G. Lloyd who reports as follows: "It is none of our usual species, and if named has been named from the tropics." "There have been large numbers of tropical *Hypoxylons* accumulated unnamed in our museums, and we expect on our next trip to Europe to hunt them up as far as possible."

3. **XYLARIA** Hill.

1. **X. hypoxylon** (L.) Grev. Fl. Edin. 355 (1824). *teste* Burt.

Young conidial stroma on a dead stump, Pebble Beach Canyon, Dec. 26, 1920, *Nuttall* 994.

LICHENS*

Plant forms from insular regions are nearly always interesting, and the Lichen Flora of the Santa Catalina Island proves to be no exception to a somewhat elastic rule. The student of Lichen specimens from the Island at once perceives that the material represents normally developed and colored examples of the various species. Microscopical study of the internal characters further develops the fact that the outward influences governing physiological developments have been entirely favorable.

It is well known that Lichen growth takes place only when the tissues of the plant are in a moist condition, and it is equally well understood that the individual development proceeds the more favorably when an alternation of dry and moist conditions prevail.

The writer has no definite information regarding climatic conditions in Santa Catalina Island. The evidence afforded by the Lichens collected by Mr. Nuttall and others, and examined with considerable detail, shows clearly that the elements of sunlight and moisture essential for healthy growth are nearly ideal.

A comparison of the following list of species and forms with what is known of the Lichens of California, Washington, Maine and Florida shows that 84% of the Catalina species are found on the mainland of California, 45% in the State of Washington, 44% in Maine, and 21% in Florida. The zonal distribution is somewhat perplexing, and ranges from known Canadian forms on the one hand, to upper Sonoran or even Austro-riparian on the other.

Family I. VERRUCARICEAE

I. VERRUCARIA Pers.

1. *V. rupestris* Schrad. Spicilg. Fl. Germ. 109 (1794).

On small stones on a shady bank, altitude 500 feet; *Nuttall* 483.

2. *V. margacea papillosa* (Ach.) Nyl. Lich. Scand. 272 (1861).

On rocks or earth; probably collected by Dr. *Hasse*, but the species is not credited to Santa Catalina in his Lichen Flora. *McClatchie* lists it on the authority of *Hasse*.

*By G. K. Merrill.

3. **V. maura** Wahl. in Ach. Method. Suppl. 19 (1803).
On beach rocks; *Trask, fide* Hasse.

Family 2. DERMATOCARPACEAE

1. DERMATOCARPON (Eschw.) Th. Fr.

1. **D. miniatum** (L.) Fr. Syst. Orb. Veg. 259 (1825)
On rocks, Silver Canon; *Nuttall 449* and Gallagher's Canon.
1114.

Family 3. PYRENULACEAE

1. ARTHOPYRENIA Mass.

1. **A. (Acrocordia) bifromis** (Borr.) Müll. in Flora 66:306 (1883).
On Photinia; *Hasse.*
2. **A. (Acrocordia) sphaeroides** (Wahl.) Zahl. Bryolog. 12:61 (1914).

Thallus effuse, smoothish, light gray with a faint yellowish dash; apothecia dimidiate, dull black, hemispherical, at the base thinly covered by the thallus. Spores 8, ellipsoid, bilocular, 14-16x6-8 μ .

The section *Acrocordia* of *Arthopyrenia* is marked by the presence of linear asci, with the spores more or less serially disposed.

On oaks; *Hasse.*

3. **A. punctiformis** (Pers.) Arn. in Flora 68:160 (1885).
On Photinia; *Hasse.*
4. **A. fallax** (Nyl.) Arn. in Flora 68:159 (1885).
Verrucaria epidermidis fallax Nyl. Bot. Notis. 1852:178.
Not deserving of specific rank, for it is merely *A. punctiformis* with distinct paraphyses.
On various barks; *Hasse.*

2. PORINA (Ach.) Müll.

1. **P. plumbaria** (Stiz.) Hasse, Contr. U. S. Nat. Herb. 17:12 (1913).
On *Crossosoma californica*; *Nuttall 459*, and on *Neostyphonia integrifolia*, 388.

Family 4. **MYCOPORACEAE**

1. **MYCOPORELLUM** Müll.

1. **M. Hassei** Zahlbr. in Hasse Contr. U. S. Nat. Herb. 17:13 (1913)

Type locality near Avalon, on *Crossosoma californica*, *Hasse*. Type in herb. Zahlbruckner; co-type in herb. Hasse, Harvard, and herb. Field.

Family 5. **CALICIACEAE**

1. **CALICIUM** Pers.

1. **C. parietinum** Ach. Vet. Ak. Handl. 260 (1816).

On decorticated *Sambucus glauca*, Pebble Beach Canon; on *Lyonothamnus*, Gallagher's Canon; and on *Crossosoma*, Big Wash Canon; *Nuttall* 521, 887, 888.

2. **SPHINCTRINA** Fries.

1. **S. microcephala** (Tul.) Nyl. in Mem. Soc. Cherb. 91. (1857).

On decorticated branches of *Adenostoma fasciculata*, Equestrian Trail, *Nuttall* 773.

Family 6. **CYPHELIACEAE**

1. **CYPHELIUM** Th. Fr.

1. **C. Bolanderi** (Tuck.) Zahl. in Eng. & Prantl Nat. Pflanzenfam. 1.1*:84 (1907).

On rocks, common or mountain tops; *Nuttall* 473.

Family 7. **ARTHONIACEAE**

1. **ARTHONIA** Ach.

1. **A. gyalectoides**, Müll. in Flora 69:128 (1886).

On *Photinia*, *Hasse*. So. Calif. Acad. Sci. 2:72 (1903).

2. **A. impolita** (Ehrh.) Borr. in Eng. Bot. Suppl. 1. 2692, f. 1 (1831).

On bark of *Photinia*. *Hasse*.

3. **A. lecanactidia** Zahl. Beih. Bot. Centralbl. 13:155 (1892).

On *Lycium californicum*, Isthmus; *Hasse*.

4. **A. radiata Swartziana** (Ach.) Willey, Syn. Arth. 44 (1890).
On various barks; *Hasse*.
5. **A. radiata angustata** Wain. Adjumenta Lich. Lapp. Fenni. 2:157 (1883).
Apothecia linear, simple or branching, the thallus limited by a black hypothalline line, measurements and reactions as in the species.
On caudex of *Coreopsis gigantea*; *Hasse*.
6. **A. rhoidis** Zahl. Beih. Bot. Centralbl. 13:156 (1902).
Type on bark of *Melosma laurina*; *Hasse*.
7. **A. punctiformis** Ach. Lich. Univ. 141 (1810)
On bark of *Photinia*; *Hasse* (as *Verrucaria punctiformis*); on bark of *Nicotiana glauca*; *Nuttall* 373.
8. **A. stictella** Stiz., *Hasse*, Contrib. U. S. Natl. Herb. 17:20 (1913)
On *Lonicera catalinense*; *Hasse*.
9. **A. tetramera** (Stiz.) *Hasse*, Contrib. U. S. Natl. Herb. 17:19 (1913).
On bark of *Lonicera catalinense* and on oaks; *Hasse*.
10. **A. polygramma** Nyl. in Prod. Fl. Nov. Gran. ed. 1:66 (1863).
On *Populus trichocarpa*; *Nuttall* 386, and on *Neostyphonia integrifolia*; *Hasse*.
11. **A. gregaria** (Weig.) Koerb. Syst. Lich. Germ. 291 (1855).
Thallus determinate, often developed under the bark, grayish or reddish, thin, filmy, sometimes furfuraceous; apothecia irregularly rounded or elongate, scattered or confluent, the disc plane, depressed, somewhat whitish or cinnabar-reddish pruinose; spores obovate-clavate usually four-septate, the upper cell larger, 18-26x7-9 μ .
This species is not enumerated in the Lichen Flora of Dr. *Hasse*, and is inserted here with some doubt.
On *Quercus tomentella*; *Trask*, *vide* *Hasse*.
Arthonia pyrrhuliza Nyl., *A. dispersa* Schrad., and *A. dispersa cytisi* Mass. have been listed from Catalina by Dr. *Hasse*, but do not appear in the Lichen Flora.

2. ARTHOTHELIUM Mass.

1. **A. orbiliferum** Almq. Mem. Arth. Scand. 41 (1880)
On *Photinia*; *Hasse*.

2. **A. sanguineum** (Willey) Zahl. in Engl. & Prantl Natl. Pflanzel. 1.1*:91 (1907).
Arthonia sanguinea Willey Syn. Arth. 22 (1890).
On Oak bark, *Hasse*.
3. **A. anastomosans** (Ach.) Hasse, Contrib. U. S. Natl. Herb. 17:28 (1913).
Arthonia anastomosans Ach.
On barks. *McClatchie*; *Hasse*.
4. **A. subcystodes** (Willey) *comb. nov.*
Arthonia subcystodes Willey, Syn. Arth. 51 (1890).
Thallus thin, white; apothecia rounded, convex; spores 4-8, oblong-ovoid muriform, the transverse cells about 8, the longitudinal in the center about 3, 22-27x7-11 μ .
On Photinia; *Hasse*.
5. **A. spectabile** (Flot.) Mass. Rich. Lich. 54 (1852).
Thallus whitish, thin, effuse, unequal, subfarinaceous; apothecia brownish-black, rather large, angularly roundish, often surrounded by a spurious thalline margin, scattered or crowded and subconfluent; spores muriform, colorless, becoming brown. 30-36x15-17 μ .
On various barks; *Hasse*.

Family 8. GRAPHIDACEAE

I. OPEGRAPHIA Humb.

1. **O. Chevallieri** Leight Ann. Mag. Nat. Hist. 88:13:90 (1854).
On argillaceous rock; *Hasse*.
2. **O. pulicaris** (Hoffm.) Nyl. Hue Addenda Nov. Lich. Eur. 61:247 (1878).
On *Neostyphonia integrifolia*; *Hasse*.
3. **O. rimalis** Ach. Lich. Univ. 260 (1810).
On various barks; *Hasse*.
4. **O. vulgata** Ach. Method. Lich. 20 (1803).
On bark, *Trask*; *Hasse*; on bark of *Laurocerasus Lyoni*, Swain's Canyon, *Nuttall* 635, on bark of oak, Pebble Beach Canyon, *Nuttall* 534.

5. **O. Hassei** Zahl. Ann. Mycologici 10:363 (1912).
On rocks; *Hasse*.
6. **O. betulina** (Sm.) Nyl. Hue Addend. Nov. Lich. Eur. 248. (1878).
On oak; *Hasse*.

Family 9. **CHIODECTONACEAE**

1. **CHIODECTON** Ach.

1. **C. ochroleucum** Zahl. Bull. Torr. Bot. Club. 27:646 (1900).
On *Neostyphonia intergrifolia*; *Trask 694*.
2. **C. sanguineum** (Sw.) Wain. Etud. Lich. Brasil 2:143 (1890).

This species is reported by Dr. Hasse from Santa Catalina Island, in one of his occasional papers, but it is not included in his Lichen Flora. There seems to be no ready explanation for the omission, except that the original specimens were mistakenly placed.

2. **SCLEROPHYTON** Eschw.

1. **S. californicum** (Tuck.) Hasse, Contrib. U. S. Natl. Herb. 17:27 (1913).
On *Neostyphonia integrifolia*; *Isthmus*; *Hasse*.

Family 10. **DIRINACEAE**

1. **DIRINA** Fr.

1. **D. Hassei** Zahl. in Bull. Torr. Bot. Club. 27:644 (1900).
On bark of *Photinia arbutifolia* and *Melosma laurina*; *Hasse*.
2. **D. rediunta** (Stiz.) Zahl. Hasse Contrib. U. S. Natl. Herb. 17:27 (1913).
On *Umbellularia californica*; *Hasse*.
3. **D. catalinariae** Hasse, Bryologist 14:102 (1911).

Thallus determinate, thick, areolate-rimrose, white, reaction with KHO yellowish, with CA (Clo)₂ pinkish-red; apothecia 1.5-2 mm. wide substipitate upon a short stout thalline elevation, disk round or slightly angular, dark but covered by a dense white pruina, proper margin thin, hidden by a turgid thalline one; spores rarely found fusiform with rounded ends, straight or slightly curved, 24-30x55-8 μ hypothecium thick, dark brown.

Type on beach boulders near Avalon; *Hasse*.

Family 11. **ROCCELLACEAE**

1. **DENDROGRAPHA** Darbish.

1. **D. leucophaea** (Tuck.) Darbish. Ber. der Deutsch. Gesellsch. 16:13 (1898).
On shrubs, *Trask*; on *Neostyphonia integrifolia*, Isthmus; *Nuttall* 913.
2. **D. leucophaea minor** (Tuck.) Darbish. Ber. der Deutsch. Gesellsch. 16:13 (1898).
On rocks exposed to ocean spray; *Hasse*; *McClatchie*.

2. **ROCCELLA** Lam. & DC.

1. **R. fuciformis** (L.) Lam. & DC. Flora Franc. 2:335 (1805).
On rocks; *Trask*.

3. **SCHIZOPELTE** Th. Fr.

1. **S. californica** Th. Fr. in Flora 58:143 (1875).
On rocks; *Hasse*.

Family 12. **LECANACTIDACEAE**

1. **LECANACTIS** Eschw.

1. **L. salicina** Zahl. Hasse in Bryologist 11:7 (1906).
On bark of *Lyonothamnus floribundus*, Isthmus; *Nuttall* 651.
2. **L. californica** Tuck. Syn. 2:115 (1888).
On twigs; *Hasse*; *McClatchie*; on twigs of *Neostyphonia ovata*, Silver Canyon; *Nuttall* 462.
3. **L. dubia** *sp. nov.*

Thallus thin, filmy, whitish-ashy, effuse, no hypothallus perceptible, the algae normal to the genus; apothecia small, a little elevated, substipitate, black, the margin not very evident except in the lesser patellae, the disk commonly plano-convex, but now and then slightly concave, the epithecium roughened; spores 8-nae. fusiform, four-locular, $24-30 \times 7-8 \mu$, the hypothecium black.

Some of the apothecia approach the graphidaceous type, and in some aspects the plant approaches the Pyrenomycetous fungi. The presence of algae, and definite Lichen spores, warrant the present disposition.

On bark of *Lyonothamnus floribundus*, Isthmus; *Nuttall* 648.

2. **SCHIZMATOMMA** Fl. & Kb.

1. **S. californicum** (Tuck.) Herre, Hasse Contrib. U. S. Natl. Herb. 17:33 (1913).
On *Quercus*, Pebble Beach Canon; *Nuttall* 533.
2. **S. hypothallinum** Zahl. Bull. Torr. Club. 27:645 (1900).
Type on rocks; *Trask* 692; *Hasse*.
3. **S. pluriloculare** Zahl. Engl. & Prantl Nat. Pflanzen. 1.1*:116 (1907).
Type on bark of *Neostyphonia integrifolia*; *Hasse*.

Family 13. **DIPLOSCHISTACEAE**

1. **DIPLOSCHISTES** Norm.

1. **D. scruposus** (L.) Norm. Con Praem. Gen. in Nyt. Magazin fur Naturvidensk 7:232 (1853).
On rocks and earth, mountain tops; *Nuttall* 474 and 485; *Hasse*.
2. **D. gypsaceus** (Ach.) Hasse. Contrib. U. S. Natl. Herb. 17:34 (1913).
On sterile clay soil; *Trask*.

Family 14. **LECIDEACEAE**

1. **LECIDEA** Ach.

1. **L. fumosa** (Hoffm.) Ach. Method. Lich. 41 (1803).
On granite rocks; *Hasse*.
2. **L. lapicida** Ach. Method. Lich. 37 (1803).
On granite and crystalline rocks; *Trask*; *Hasse*.
3. **L. lapicida declinans** Nyl. Lich. Scand. 226 (1861).
On calcareous rocks; *McClatchie*. Appearing by name in the earlier publications of Dr. *Hasse*, but no mention of it is made in the Lichen Flora.
4. **L. latypaea** Ach. Method. Lich. Suppl. 10 (1803).
On calcareous rocks; *Hasse*.

5. **L. catalinaria** Stiz. Hasse. Bull. Torr. Bot. Club. 24:447 (1897).
On sandstone boulder; *Hasse*; on volcanic rock at Isthmus; *McClatchie*.
 6. **L. goniphila** Schaer. Enum. 127 (1850).
On sandstone; *Hasse*.
 7. **L. (*Biatora*) glebulosa** (Sm.) Schaer. Enum. Lich. Europ. 100 (1850).
On crumbling sandstone and earth; *Hasse*.
 8. **L. (*Biatora*) phaeophora** Stiz. Hasse. Bull. Torr. Bot. Club. 24:448 (1897).
On calcareous rocks; Avalon, *Hasse*.
 9. **L. (*Biatora*) coarctata** (Sm.) Nyl. Act. Soc. Linn. Bord. ser. 3. 1:358 (1858).
On earth and rocks; *Hasse*.
- Dr. Hasse at one time listed *Lecidea minuta* and *L. sylvana* Koerb. both of the section *Biatora*, but the names do not appear in the Lichen Flora.
10. **L. (*Psora*) luridella** (Tuck.) Hasse. Contrib. U. S. Natl. Herb. 17:46 (1913).
On earth; *Hasse*; on clay; *McClatchie*.
 11. **L. (*Psora*) scotopholis** (Tuck.) Herre Proc. Wash. Acad. Sci. 12:80 (1910).
On quartzose rock; *Hasse*.

2. CATILLARIA Mass.

1. **C. Griffithii** (Sm.) Merl.
On *Quercus*, Pebble Beach Canon; *Nuttall* 511; on bark; *Hasse*.
This is *Catillaria tricolor* of *Hasse*.
2. **C. lenticularis ecrustacea** Hepp. ex Arnold in Flora 41:502 (1858).
On sand rock; *Hasse*.

3. BACIDIA DeNot.

1. **B. clementis** Hasse, Bryologist 13:61 (1910).
On bark of *Quercus*, Mountain top; *Nuttall* 467.

2. **B. Naegelii** (Hepp.) Zahl. Engl. & Prantl. Nat. Pflanzen I. I*: 135 (1907).

On oak; *Hasse*; *McClatchie* (as *Buellia*).

3. **B. endoleuca** (Nyl.) Kickx. Fl. Crypt. Fland. 1:261 (1867).

Thallus composed of minute granules, these usually contiguous and united into a roughened chinky or subleprose crust, ashy or glaucous; apothecia rather small, sessile, flat or rarely concave, margin more or less persistent, black or reddish-black; spores acicular, the cells various in number, 30-50x3.4-5 μ , hypothecium reddish-brown.

On *Sambucus glauca*; *Hasse*.

4. **TONINIA** Mass.

1. **T. aromatica** (Sm.) Mass.) Syn. Lich. 54 (1855).

On rocks; *Hasse* (as *Lecidea aromatica*); *McClatchie*.

5. **RHIZOCARPON** Ramond.

1. **R. Bolanderi** (Tuck.) Herre Proc. Wash. Acad. Sci. 12:106 (1910).

On rocks; *Hasse*.

2. **R. oidaleum** (Tuck.) Merl.

On bark of shrubs; *Hasse*; *McClatchie*; on *Quercus dumosa* and *Ceanothus megacarpus*; *Nuttall* 446, 455; on *Arctostaphylos*, Gallagher's Canyon; *Nuttall* 861.

3. **R. penichraeum** (Tuck.) Merl.

This differs little from *R. oidaleum* except by possessing a white thallus. In Tuckerman's view it is merely a variation of that species.

On bark of *Photinia*; *Hasse*.

4. **R. confervoides** DC. Fl. Franc. 2:565 (1805).

Thallus verrucose-areolate, dark gray, brownish-gray, or some shade of brown, the areoles discrete or approximate upon a conspicuous black hypothallus; apothecia sessile upon the hypothallus, moderate, the disk black, plane or convex with a more or less persistent margin; spores 6-8-nae., variable in size and color, muriform.

This is the *Buellia petraea* of certain papers of Dr. *Hasse*.

On rocks; *Hasse*.

Family 15. **CLADONIACEAE**

I. **CLADONIA** Hill.

1. **C. furcata racemosa** (Hoffm.) Flk. Clad. Comm. 152 (1828).
On earth of hillside; *Nuttall 427*.
2. **C. furcata corymbosa** Nyl. Syn. Lich. 207 (1860).
On earth; *Hasse*.
This is merely a form of the above.
3. **C. furcata pinnata** Flk., Schleich. Cat. Absol. 47 (1821).
This is a state of *C. furcata* in which the podetia are more or less clothed with leaflets.
On trunk of fallen oak, altitude 1,000 feet, Gallagher's Canyon; *Nuttall 1132a*; *Knopf 404*.
4. **C. pyxidata chlorophaea** Flk. Clad. Comm. 70 (1828).
On earth of hillsides; *Hasse*; *Nuttall 420, 428*; *Knopf 414* without locality.
5. **C. fimbriata simplex** (Weis.) Flot. Linnaea 18 (1843).
On ground among mosses; *Hasse*.
6. **C. fimbriata fibula** (Ach.) Nyl. ex Norrl. Med. Soc. pr. F. et F. Fenn. 12 (1876).
On earth; *Hasse*.
7. **C. ochrochlora evoluta** *nov. forma*.
Podetia greatly elongated, attaining to the length of two inches.
On a fallen trunk, Gallagher's Canyon; *Nuttall 1132*.
8. **C. verticillata** Hoffm. Deutsch. Fl. 2:122 (1796).
Primary thallus of moderate sized leaflets, usually more or less incised, olive-green or glaucous; podetia corticated, glabrous, elongate-turbinate, scyphiferous and repeatedly proliferous from the center of the inferior cups, the margin dentate when sterile; apothecia brown or reddish-brown and moderate in size.
On earth of hillsides; *Nuttall 429*.
Not previously reported from southern California.

Family 16. **ACHAROSPORACEAE**

I. **BIATORELLA** DeNot.

1. **B. simplex** (Dav.) Br. & Rostr. Bot. Tidssk. 3.241 (1863).
On rocks, altitude 1,000 feet, on ridge between Chicken Johnny's and Rock Falls Canyon; *Nuttall 477*.

2.. ACAROSPORA Mass.

1. **A. fuscata** (Schrad.) Arn. Lich. Jura 101.
On rocks; *Nuttall* 489.
2. **A. obpallens** (Nyl.) Zahl. Beih. Bot. Centralbl. 13:161 (1902)
On earth and crumbling sandstone; *Hasse*.
3. **A. Schleicheri** (Ach.) Mass. Ricerche, 27, f. 43-46 (1852).
On earth; *Hasse*.
4. **A. xanthophana** (Nyl.) Fink. Contr. U. S. Natl. Herb. 14:170 (1910).
On rocks; *Trask*; *Hasse*; *Eastwood*; on rocks on mountain tops; *Nuttall* 478.

Family 17. HEPPIACEAE

1. HEPPIA Naeg.

1. **H. Guepini** (Del.) Nyl. apud Stiz. Lich. Helvet. in Jahresb. St. Gallisch. Ges. 336 (1882).
On rocks, Silver Canon; *Nuttall* 450.
2. **H. leptopholis** Nyl., *Hasse*. Lich. So. Calif. 10 (1898).
On earth; *Hasse*.

Family 18. PERTUSARIACEAE

1. PERTUSARIA Lam. & DC.

1. **P. flavicunda** Tuck. Obs. Lich. 4, in Proc. Am. Acad. 7:176 (1877).
On rocks; *Trask*.
2. **P. Wulfenii** DC. Fl. Franc. 2:320 (1805).
On bark; *Trask*.
3. **P. multipuncta** (Turn.) Nyl. Not. Sällsk. Fl. Faun. Fenn. 5:179 (1861).

Thallus thinnish, granulate or unequally rugose, rimose, whitish or grayish-white; apothecia in enlarged verrucae, usually numerous in each, from pale to blackish, bluish-pruinose or at length naked, the verrucae more or less white-sorediate; spores oblong or ellipsoid-oblong 100-145x30-70 μ .

On *Quercus dumosa*; *Nuttall* 444.

Not previously reported from California.

Family 19. **LECANORACEAE**1. **LECANORA** Ach.

1. **L. pallida** (Schreb.) Schaer. Enum. Lich. Eur. 78 (1850).

Apparently a common form on Catalina, on shrubs and trees; *Hasse* (often reported as *Lecanora albella*); on *Quercus dumosa*, *Sambucus glauca*, *Adenostoma fasciculata*, *Lyonothamnus floribundus* and *Rhamnus insulus*, *Nuttall* 445, 445a, 532, 650, 768, 842.

2. **L. cancriformis** (Hoffm.) comb. nov.

Reckoned by Tuckerman in his Synopsis as a variation of *L. pallida* this plant in its best development is clearly distinct. The thallus has much the same coloration as that of *L. pallida*, but the apothecia are larger, often very much so, with a thickened thalline margin. The disk is pink or pinkish, and somewhat pruinose, and the margin is occasionally proliferous toward the center of the disk.

On *Photinia arbutifolia*, mountain top; *Nuttall* 468; *Hasse*.

3. **L. atra** (Huds.) Ach. Lich. Univ. 344 (1810).

On rocks; *Hasse*; *McClatchie*; *Nuttall* 475 and 480.

4. **L. sordida** (Pers.) Th. Fr. Nov. Act. Soc. Sci. Ups. 3:215 (1861).

On rocks; *Eastwood*; *Nuttall* 475a.

5. **L. subfusca** (Nyl.) Ach. Lich. Univ. 393 (1810).

On trunks of trees; *Baker*; *Trask*, *vide Hasse*.

6. **L. rugosa** (Pers.) Nyl. note 2, Flora 250 (1872).

Not reported in *Hasse's Lichen Flora*.

On barks; *Trask*, *vide Hasse*.

7. **L. symmicta** (Ach.) Nyl. Flora 249 (1872).

On bark; *McClatchie*; *Hasse*.

8. **L. pacifica** Tuck. Syn. No. Am. Lichens 1:191 (1882).

On *Sambucus glauca* and *Photinia arbutifolia*; *Nuttall* 464, 469.

9. **L. cinerea** (L.) Somerf. Suppl. Fl. Lapp. 99 (1826).

On rocks, mountain top; *Eastwood*, *vide Hasse*; *Nuttall* 484.

10. **L. laevata** (Ach.) Nyl. Flora 364 (1872).

On rocks; *Hasse*.

11. **L. (*Placodium*) saxicola** (Poll.) Ach. Lich. Univ. 431 (1810).
On rocks; *Hasse* (as *Lecanora muralis*); mountain top, *Nuttall* 482.

Lecanora catalinae Stiz. and *L. subcarnea* Ach. are listed from Catalina Island in one of the earlier publications of Dr. Hasse, but do not appear in the Flora.

2. OCHROLECHIA Mass.

1. **O. pallescens** (L.) Koerb. Syst. Lich. Germ. 149 (1855).
On bark; *Trask*, *vide* *Hasse*.

3. LECANIA Mass.

1. **L. brunonis** (Tuck.) Herre, Proc. Wash. Acad. Sci. 12:188 (1910).
On rocks; *Hasse*.
2. **L. dimera** (Nyl.) Oliv. Lich. l'Ouest et Nord-Ouest Franc. 1:309 (1897).
On barks; *Trask*, *vide* *Hasse*.
3. **L. fructigena** Zahl. *Hasse* in *Bryologist* 17:61 (1914).

Thallus crustaceous, of dark gray to blackish, small, more or less dispersed warts, or of flat-concave or rugose squamules with coarsely crenate or lobulate borders, somewhat shining; apothecia sessile or slightly elevated, disk flat or slightly convex, brownish-black or black, the proper margin concolorous and at length disappearing. Spores 8, oblong, bilocular, 12-17x5.5-6 μ .

On rocks; *Hasse*.

4. PLACOLECANIA (Stein.) Zahl.

1. **P. candicans** (Fr.) Zahl. in Engl. & Prantl Nat. Pflanzenim. 1.1*:205 (1907).
On calcareous rocks; *Hasse*.

5. PHLYCTIS Wallr.

1. **P. argena mucronata** *nov. forma*.

Distinguished from the species by its mucronate spores. Apiculate spores are characteristic of *P. agelaea* but denied to the present species.

On bark; *Hasse* (as *Phlyctis argena*).

Family 20. **PARMELIACEAE**1. **PARMELIA** Ach.

1. **P. vittata** (Ach.) Nyl. Flora 106 (1875).
On Manzanita; *E. A. McGregor* in herb. Merrill.
Previously unreported from the Island.
2. **P. enteromorpha** (Ach.) Nyl. Syn. Lich. 1:401 (1860).
On Rhamnus insulus; Nolava Canyon; *Nuttall 514*; and on Ceanothus, 453; *Trask, fide* Hasse.
3. **P. conspersa** (Ehr.) Ach. Method. Lich. 105 (1803).
On rocks, mosses and earth; *Nuttall 481, 434*.
4. **P. perlata** (L.) Ach. Method Lich. 216 (1803).
On trees; *Knopf 406* Banning's Canyon; on earth *Trask, fide* Hasse.
5. **P. olivaria** (Ach.) Hue Lich. Ex. Europ. suite 1:195 (1901).
On trunks; *Trask fide* Hasse (as *Parmelia olivetorum*).
6. **P. perforata hypotropa** (Nyl.) Tuck. Syn. No. Am. Lich. 1:53 (1882).
Previously unreported from California, but Dr. Herre records *P. perforata* from the vicinity of San Francisco.
The var. *hypotropa* differs from the species only in that the inferior surface of the lobes are wholly or partially dealbate marginally.
On *Quercus dumosa*; *Nuttall 431*.
7. **P. laevigata** (Sm.) Ach. Syn. Lich. 212 (1814).
On *Quercus dumosa*; *Trask, fide* Hasse.
There is some doubt regarding the occurrence of this species on Catalina Island, as it is not recorded in the Lichen Flora of Hasse.
8. **P. caperata** (L.) Ach. Method. Lich. 216 (1803).
On oak. Lyonothamnus grove below the base of Black Jack and in Bulrush Canyon, *Knopf 302, 406*.
Described by Dr. Hasse in the Lichen Flora as *P. cylisphora*.

2. **CETRARIA** Ach.

1. **C. californica** Tuck. Am. Jour. Sci. 28:203 (1859).
On Rhamnus; Nolava Canyon, *Nuttall 513*, and on Ceanothus megacarpus, 454.

Family 21. USNEACEAE

1. RAMALINA Ach.

1. **R. ceruchis** (Ach.) DeNot. Giorn. Bot. Ital. 1:45 (1859).

On *Quercus dumosa*; Mountain top; *Nuttall* 439; on large boulders of a high ridge between Bulrush Canyon and the Pacific, *Knopf* 316, 333; *Trask* (fide Hasse, as *Roccella ceruchis*).

2. **R. ceruchis combeoides** (Nyl.) Tuck. Syn. No. Am. Lich. 1:21 (1882).

On *Neostyphonia ovata*, sea cliffs at mouth of Silver Canyon; *Nuttall* 441; *Trask* (fide Hasse, as *Roccella combeoides*).

3. **R. homalea** Ach. Lich. Univ. 598 (1810).

On sea cliffs, and stones in bed of creek; Silver Canyon, *Nuttall* 447; Jewfish Point; *Knopf* 333a; on rocks exposed to the spray of sea water, *Hasse*; *McClatchie* (fide Hasse).

4. **R. Menziesii** Tuck. Proc. Am. Acad. Arts and Sci. 1:204 (1847).
On shrubs; *Hasse*.

5. **R. reticulata** (Noehd.) Kremp. Geschichte u. Litt d. Lich. 1:80 (1867).

On *Quercus*; highlands beyond summit; *Nuttall* 465; plants 3 feet long depending from scrub oak on the summit of "Nigger Head" at Catalina Harbor, *Knopf* 171; the longest specimens were found on live oak on the divide at the head of Banning's Canyon. *Knopf* 74.

6. **R. farinacea** (L.) Ach. Lich. Univ. 606 (1810).

On various trees and shrubs; *Nuttall* 438, 865, 860, 440; *Trask*, fide Hasse.

7. **R. farinacea latus** Merl. Bryologist, 11:48 (1908).

On telephone poles; *E. A. McGregor* in herb. Merrill.
Distinguished from the species by its wider lobes.

8. **R. pollinaria** (Westr.) Ach. Lich. Univ. 608 (1810).

On *Cercocarpus betulifolius*; Gallagher's Canyon, *Nuttall* 866.
This species is rarely found in North America.

9. **R. intermedia** Del. ex Nyl. Bull. Soc. Linn. Norm. ser. 2. 4:166 (1870).

On shrubs; *Hasse*.

This species is listed in one of the occasional papers of Dr. Hasse, but is not mentioned in the Lichen Flora.

Dr. Hasse also reports *Ramalina fraxinea* (L.) Ach., but the plant is very rare in North America and, without doubt, the infertile specimen he describes belongs to some other species.

2. **USNEA** (Dill.) Pers.

1. **U. hirta** (L.) Hoffm. Deutsch. Fl. 2:133 (1795).
On trees; *Hasse*.
2. **U. ceratina** Ach. Lich. Univ. 610 (1810).
On trees; *Hasse*.
3. **U. dasypoga** (Ach.) Nyl. ex Stiz. St. Gall. Nat. Ges. 202 (1876).
On trees; *Trask, fide Hasse*.
4. **U. dasypoga scabrata** Nyl. Flora 209 (1885).
On shrubs; *Trask, fide Hasse*.
5. **U. rubiginea** (Michx.) Herre. Proc. Wash. Acad. Sci. 12:223 (1910).
On trees; *Trask, fide Hasse*.

No examples of the Genus *Usnea* were found in the material collected by Nuttall or Kopf, a fact worthy of note when it is considered that the plants are all conspicuous.

3. **EVERNIA** Ach.

1. **E. prunastri** (L.) Ach. Lich. Univ. 442 (1810).
On trees; *Trask, fide Hasse*.

Family 22. **CALOPLACACEAE**

1. **BLASTENIA** Mass.

1. **B. ferruginea** (Huds.) Koerb. Syst. Lich. Germ. 184 (1855).
On *Quercus*, *Photinia*, and *Laurocerasus*; *Nuttall* 443, 451, 470, 518; also reported by *Hasse* on bark and rocks.
2. **B. ferruginea Wrightii** (Tuck.) Hasse Contrib. U. S. Natl. Herb. 17:111 (1913).
On bark; *Hasse*.

2. **CALOPLACA** Th. Fr.

1. **C. aurantiaca** (Lightf.) Th. Fr. Lich. Arctoi, Eur. 219 (1860).
On various barks; *Hasse*.

2. **C. cerina** (Ehrh.) Th. Fr. Lich. Arctoi, 218 (1860).
On *Sambucus glauca*; *Nuttall 461*; *Hasse* (as *Caloplaca gilva*).
3. **C. bolacina** (Tuck.) Herre Proc. Wash. Acad. Sci. 12:233 (1910).
On rocks and earth; Mountain top, *Nuttall 488*.
4. **C. coralloides** (Tuck.) Zahl. Ann. K. K. Nat. Hofmus. 22:116 (1807).
On sandstone; *Trask, fide Hasse*.
5. **C. elegans** (Link) Th. Fr. Lich. Scand. 1:168 (1871).
On rocks; *Hasse* (as *Placodium elegans*); *McClatchie*.
6. **C. murorum** (Hoffm.) Th. Fr. Lich. Scand. 1:170 (1871)
On rocks; *Trask, fide Hasse*; *Hasse*.
7. **C. murorum miniatum** (Hoffm.) Th. Fr. Lich. Scand. 1:170 (1871).
Differs from the species only in the intensity of its coloration.
On rocks; common, *Nuttall 486, 487*.

Family 23. THELOSCHISTACEAE

1. XANTHORIA Th. Fr.

1. **X. lychnea** (Ach.) Th. Fr. Lich. Scand. 1:146 (1871).
On *Salix lasiolepis*; *Nuttall 617*; and on *Photinia*; Stage Road near Summit; *Knopf 301*.
2. **X. polycarpa** (Ehrh.) Oliv.
On *Quercus dumosa*; *Nuttall 442*, and on *Laurocerasus, 452*.

Xanthoria parietina is also listed by Dr. Hasse in one of his earlier papers, but does not appear in the Lichen Flora.

2. THELOSCHISTES Norm.

1. **T. chrysophthalmus** (L.) Th. Fr. Gen. Heterol. Eur. 51 (1861).
On *Salix lasiolepis*; Nolava Canyon, *Nuttall 617*. Also reported by *Hasse*.
2. **T. flavicans** (Sw.) Norm. Gen. Lich. 17 (1852).
On *Quercus*; Mountain top, *Nuttall 448*; and Middle Ranch Canon Summit, *Knopf 300*.

Family 24. **BUELLIACEAE**1. **BUELLIA** DeNot.

1. **B. alboatra** (Hoffm.) Th. Fr. Lich. Scand. 2:607 (1874).
On rocks; *Hasse*.
2. **B. alboatra ambigua** (Ach.) Lich. Scand. 2:608 (1874).
On rocks; *Hasse*; *McClatchie*.
3. **B. lepidastr**a Tuck. Gen. Lich. 186 (1872).
On rocks; Mountain top, *Nuttall 490*; *Trask, fide Hasse*.
4. **B. badia** (Fr.) Koerb. Syst. Lich. Germ. 226 (1855).
On rocks; *Hasse*; *McClatchie*.
5. **B. stellulata** (Tayl.) Mudd. Man. Brit. Lich. 216 (1861).
On rocks; *Hasse*; *McClatchie*.
6. **B. disciformis** (Fr.) Mudd. Man. Brit. Lich. 216 (1861).
On bark; *Hasse* (*B. Parasema* of the Lichen Flora).
7. **B. disciformis triphragmia** (Nyl.) Boist. Nouv. Fl. Lich. Franc. 2:234 (1902).
On bark; *Hasse* (*B. triphragmia* of the Lichen Flora).
8. **B. halonia** (Ach.) Tuck. Lich. Calif. 26 (1866).
On *Cercocarpus* and on rocks; *Hasse*.
9. **B. spuria** (Schaer.) Koerb. Parerga Lich. 183 (1865).
On rocks; *Hasse*.

Buellia atroalbella Nyl. and *B. Traskae* *Hasse* are listed from Catalina Island in early publications of Dr. *Hasse*, but omitted from the Lichen Flora. The reason is not obvious.

2. **RINODINA** (Mass.) Stiz.

1. **R. radiata** Tuck. Proc. Am. Acad. Arts and Sci. New ser. 4:173 (1877).
On rocks; Mountain top; *Nuttall 479*; *Trask, fide Hasse*.
2. **R. radiata lactea** *Hasse*, Contrib. U. S. Nat. Herb. 17:124 (1913).
On calcareous and argillaceous rocks; *Hasse*.

3. **R. angelica** Stiz. Hasse, Bull. Torr. Bot. Club. 24:447 (1897).
On rocks; *Hasse; McClatchie*.
4. **R. turfacea** (Wahl.) Th. Fr. Lich. Arctoi 126 (1860).
On decaying roots; *Hasse*.
5. **R. Conradi** Koerb. Syst. Lich. Germ. 198 (1855).
On earth; *Hasse; McClatchie*.
6. **R. sophodes** (Ach.) Th. Fr. Lich. Arctoi 125 (1860).
On *Lyonothamnus floribundus*; *Nuttall 649*; on caudex of *Cotyledon Hasse*.

Family 25. **PHYSICIACEAE**

1. **PHYSICIA** (Schreb.) Wain.

1. **P. stellaris** (L.) Nyl. Syn. Lich. 1:424 (1860).
On bark; *Trask, fide Hasse*.
2. **P. aipolia** (Ach.) Nyl. Flora 53:38 (1870).
On rocks; *Trask, fide Hasse*.
3. **P. tenella** (Scop.) Nyl. Flora 57:306 (1874).
On *Quercus dumosa* and *Adenostoma fasciculata*; *Nuttall 432, 433, 769*, the latter number belonging with that form of the species called by different authors, *P. ascendens* or *P. tenella ascendens*. In this condition of the plant the laciniae are not appressed, but more or less erect and discrete.
4. **P. crispa** (Pers.) Nyl. Syn. Lich. 425 (1860).
On mosses, Silver Canon; *Nuttall 435*.
5. **P. caesia** (Hoffm.) Nyl. Act. Soc. Linn. Bord. 21:308 (1856).
Thallus stellate, cinerous, more or less closely adherent to the substratum, bearing conspicuous rounded gray soredia, the laciniae more or less pinnately cleft, beneath pale or nigrescent, with black or blackening rhizoids; apothecia smallish, the soon naked and black disk bordered by a thin, inflexed, sub-entire thalline margin: spores 16-23x8-14 μ .
On rocks; *Hasse*, in *Bryologist*, 18:94 (1915).

2. **ANAPTYCHIA** Koerb.

1. **A. leucomelaena** (L.) Wain. Etud. Lich. Bresil. 1:128 (1890).
On twigs; *Trask, fide Hasse* (as *Physcia leucomela*).

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- Eutypella domicalis*
- Exidia recisa* (on bark)
- Hypoxylon insigne*
- Hysterographium prominens*
- Schizoxylon insigne*
- Stereum heterosporum* (on bark)
- Stereum hirsutum* (on bark)

AGARICUS SP.

- Sepedonium chrysospermum* (on dead)

ARTEMISIA CALIFORNICA Less.

- Didymosphaeria catalinae* (on dead stems)

ARTEMISIA HETEROPHYLLA Nutt.

- Phomopsis oblita* (on dead stems)

ATRIPLEX SEMIBACCATA R. Br.

- Coniothyrium olivaceum* (on old stems)

AVENA BARBATA Brot.

- Puccinia clematidis* (on culms; leaves)
- Sphaerographium avenaceum* (on dead leaves)

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- Ustilago Lorentziana*

CEANOTHUS ARBOREUS Greene

- Cercospora Ceanothi* (fallen leaves)

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CERCOCARPUS BETULOIDES Nutt.

- Glonium parvulum*
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- Mycosphaerella Chlorogalli* (dead stems)
- Pleospora Chlorogalli* (dead stems)

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CLEMATIS LIGUSTICIFOLIA Nutt.

Cercospora squalidula (leaves)

COMAROSTAPHYLOS DIVERSIFOLIA Greene

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CRESSA TRUXILLENSIS H. B. K.

Puccinia Cressae (leaves)

CROSSOSOMA CALIFORNICA Nutt.

Eutypa lata (dead wood and bark)

Peniophora velutina (stems)

Stereum heterosporum (bark)

DIPLACUS LINEARIS Greene

Amphisphaeria dothideaspora (dead stems)

DISTICHLIS MARITIMA Raf.

Phyllachora Nuttalliana (leaves)

ENCELIA CALIFORNICA Nutt.

Cyphelia villosa (dead twigs)

Merulius confluens (dead twigs)

Stereum heterosporum (dead twigs)

ERIOGONUM NUDUM Dougl.

Uromyces intricatus (leaves)

ERIOPHYLLUM NEVINII Gray

Puccinia Eriophylli

EUCALYPTUS (CULT.)

Coniothyrium leprosum (fruits)

Corticium calliculosum (wood)

Dacryomyces deliquescent (log)

Metasphaeria anisometra (twigs)

Physalospora eucalyptina (leaves)

Pleurotus ostreatus (dead leaves)

Polystictus hirsutus (log)

Reticularia Lycoperdon (log)

Stereum heterosporum (dead wood)

Valsa Eucalypti (dead bark)

EUTYPELLA STELLULATA Sacc.

Nectria episphaeria

FOENICULUM VULGARE Gaertn.

Cladosporium herbarum (stems)

Pleospora herbarum

GALIUM ANGUSTIFOLIUM Nutt.

Metasphaeria anisometra (stems)

Sphaeropsis nebelina (stems)

GNAPHALIUM SP.

Leptosphaeria Galiorum gnaphaliana (dead stems)

HAZARDIA SQUARROSA Greene

Puccinia Grindeliae (leaves)

HETEROMELES ARBUTIFOLIA see Photinia

HOLODISCUS ARIAEOFOLIUS see Sericotheca

ISOMERIS ARBOREA Nutt.

Cladosporium herbarum (capsules)

Clasterosporium carphophilum (capsules)

JUNCUS BALTICUS Willd.

Uromyces Junci.

LAUROCERASUS LYONI Britton

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Eurotium sp.

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Pleurotus salignus (living trunk)

Propolis faginea

Schizoxylon insigne

Stereum heterosporum (bark)

LONICERA CATALINENSIS Millsp.

Hypoxyylon botrys

Mycosphaerella Clymenia (leaves)

Teichospora lonicerina (dead stems)

LUPINUS HALLII Abrams

Cladosporium herbarum forma

Pleospora infectoria (twigs)

LYONOTHAMNUS FLORIBUNDUS Gray

Agyrium rufum (dead limbs)

Hymenochaete tabacina (wood)

Hysterographium Mori (wood)

Hysterographium prominens (wood)

Poria incrustans (bark)
Sabacina podlachia (wood)
Stereum gansapatum (bark)
Stereum hirsutum (wood)
Strikeria Catalinae (wood)

MALACOTHRIX SAXATILIS T. & G.

Dichaeoma Nemoseridis (stems)

MALOSMA LAURINA Nutt.

Hysterographium prominens (dead twigs)
Metasphaeria anisometra (twigs)
Phaenangium sphaeroides (bleached wood)
Poria vaporaria (on dead)
Xylogramma nigerrima

MALVA PARVIFLORA Linn.

Puccinia malvacearum

MALVASTRUM FASCICULATUM Greene

Metasphaeria anisometra (twigs)
Puccinia Sherardiana (leaves)

MARRUBIUM VULGARE Linn.

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MEDICAGO SATIVA Linn.

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Septoria megarrhizae (leaves)

MIMULUS CARDINALIS Dougl.

Microdiplodia Mimuli (leaves)

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Glonium vestigiale (twigs)
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- Peronospora Hyoscyami* (leaves)
Phomopsis Nicotianae (bark)
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- Didymosphaeria brunneola* (stems)

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Armillaria putrida
Exidia glandulosa (bark)
Hypholoma fasciculare (dead limbs)
Merulius confluens
Merulius pilosus
Nummularia Clypeus
Physarum nutans (bark)
Polystictus hirsutus
Polystictus versicolor
Solenia cinerea (bark)
Stereum hirsutum (bark)

QUERCUS DUMOSA Nutt.

Arcyria nutans (dead)
Cronartium Cerebrum (old leaves)
Stereum hirsutum

QUERCUS MACDONALDII Greene

Dothiorella Gallae (on galls)

QUERCUS TOMENTELLA Engelm.

Clavaria flaccida (fallen limb)
Comatricha nigra ?
Hydnum ochraceum (fallen trunk; bark)
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Microdiplodia Ramonae (twigs)
Myrangium catalinae (stems)
Pleospora Labiatorum (twigs)

RHAMNUS INSULARIS Greene

*Hymenochaete rubiginosa**Hypoxyton atropurpureum* (dead log)*Hypoxyton rubiginosum**Phaenangium sphaeroides* (bleached wood)

RHUS DIVERSILOBUM see Toxicodendron

RHUS INTEGRIFOLIA see Neostyphonia

RHUS LAURINA see Malosma

ROSA CALIFORNICA C. & S.

Puccinia Rosae-californicae

RUBUS VITIFOLIUS C. & S.

Kuehneola uredinis (leaves)*Septoria Rubi* (leaves)

SALIX SP.

Poria vaporaria (on dead)

SALIX LASIOLEPIS Bth.

Craterium leucocephalum Bth.*Cytospora fugax* (dead twigs)*Fomes igniarius**Guepinia Peziza* (dead wood)*Polystictus versicolor**Septoria rhabdocarpa* (dead leaves)*Trichia fallax* (dead leaves and twigs)

SAMBUCUS GLAUCA Nutt.

*Armillaria putrida**Corticium serum**Eutypella stellulata* (bark; limbs)*Fomes igniarius**Hydnum ohioense* (bark)*Hymenochaete rubiginosa* (dead limbs)*Hypomyces rosellus* (bark; wood)*Lecanidion atratum**Lophiosphaeria querceti* (dead branches)*Nematelia nucleata* (bark)*Odontia* sp. (bark)*Orbilia chrysocoma* (rotten wood)*Peroneutypa heteracantha* (limbs)*Poria rhodella* (decorticated)*Rosellinia aquila* (wood)*Sebacina calcea* (bark)*Trichoderma lignorum* (dead leaves)

SERICOTHECA (*Spiraea*) FRANSISCANA Rydb.

Metasphaeria anisometra (dead twigs)

Schizoxylon insigne

Valsa holodiscina (dead twigs)

SOLANUM WALLACEI Parish

Metasphaeria anisometra (dead stems)

Phlyctaena arcuata (dead stems)

Phoma eupyrena (dead stems)

STEPHANOMERIA VIRGATA Bth.

Pleospora herbarum (dead stems)

SYRMATIMUM ORNITHOPUM Greene

Uromyces Loti (leaves; bracts)

TITHYMALUS LEPTOCERUS Millsp.

Melampsora monticola (leaves; pedicels)

TOXICODENDRON DIVERSILOBUM Greene

Pileolaria Toxicodendri

TYPHA LATIFOLIA Linn.

Cladosporium herbarum

) *Phoma typhicola*

Pleospora infectoria

URTICA HOLOSERICEA Nutt.

Didymella superflua (stems)

Phoma nebulosa (stems)

VERBENA PROSTRATA R. Br.

Pleospora herbarum (stems)

Septoria Verbenae (leaves)

SUPPLEMENT

Since the foregoing pages were in type the following notes and specimens from Catalina have been incorporated in the herbarium of this Museum.

Page 73

Anemopsis californica H. & A.

Knopf corroborates Brandegee's listing of this species by re-collecting it near one of the springs at Empire Quarry where: "it grows up to 2 feet high in matted beds, in sandy silt soil." His specimens (No. 510, Aug. 27, 1922) are in fine flowering and fruiting condition.

Page 77

Quercus dumosa f. *insularis* Trelease.

Fine specimens from between Middle Ranch and Eagle's Nest, *Knopf* 508. This tree was in full bloom Sept. 10, 1922; it also bore immature and full ripe acorns.

Page 91

Atriplex Breweri Wats.

Eastern end of Johnson's Beach, *Knopf* 518. "On a sandy tide flat. A bushy growth about two feet high."

Page 105

Clematis ligusticifolia Nutt.

Specimens in fine floral condition from Middle Ranch Canyon, Aug. 15, 1922, *Knopf* 505. "Some of the flowers light lavender. Climbing over bushes and trees with runners 15 to 20 feet long."

Page 112 Resedaceae.

DIPETALIA Raf.

Sepals 4. Petals 2, small, membranaceous, linear-oblong, entire or emarginate, posterior or next the axis. (Disk scarcely any.) Stamens 3, alternate with the petals. Capsule depressed-globose, somewhat 8-lobed below, opening by a quadrangular cleft at the summit: stigmas 4. Seeds 20 or more, very smooth and shining. A small glabrous annual, with crowded slightly succulent and narrowly linear leaves. Flowers in short and slender spikes.

1. **D. subulata** (W. & B.) Ktze. Rev. Gen. et Sp. 1:39 (1891)

Reseda subulata Del. Fl. Aegypt. 15 (1813)

Resedella subulata Web. & Bert. Phyt. Canar. 1:107 (1840)

Oligomeris subulata Boiss. Fl. Or. 1:435 (1867).

Oligomeris glaucescens Comb., Jacq. Voy. Bot. 24 (1841)

Ellimia ruderalis Nutt., T. & G. Fl. 1:125 (1838)

Root slender, simple. Stem branched from the base, 5-6 inches high. Leaves resembling those of *Linaria vulgaris*, but smaller. Flowers subtended by a

bract similar to the sepals, very small. Sepals all inclined anteriorly. Petals white, one of them usually emarginate. Ovary rather deeply 4-lobed below; each lobe (or carpel) more or less 2-lobed. Seeds at first bright green, at length black, narrowly reniform.

Hard loam and adobe soils. April to May. Hillsides and flats on the Pacific slope of the Salta Verde, *Knopf* 340, 418.

Page 134

***Photinia arbutifolia* Lindl.**

Specimens in fine flower, July 16-20, from Descanso Canyon and Pebble Beach, *Knopf* 497, 500.

Page 140

***Cytissus canariensis* (L.) Greene.**

As suggested on p. 140, this is evidently an establishment of the species, as this specimen was taken from a slope of Big Wash Canyon beyond the limits of the Golf Course, a situation far removed from the possibility of its having been planted. *Knopf* 486, Aug. 1, 1922.

Specimens in profuse fruit and apparently vital seed. The pods are 2 cm. long, oval-cylindric, reddish-brown, appearing constricted through the swollen seed cells, long, silky-woolly on the surface and apiculate; seeds dark red-brown, polished, lenticulo-oval, somewhat truncated at the base and with a pure-white, waxy caruncle at the hilum.

Page 165

***Toxicodendron diversilobum* Greene.**

Knopf sends in specimens of this species, 485, on which the leaves are all compounded of 5 distinct leaflets. Mr. Pollay claims (*in litt.*) to be the first to return this form from Catalina, specimens of which he sent to Brandegee.

Page 166

***Neostyphonia integrifolia* (Nutt.) Shaf.**

Mr. *Knopf* sends a quartette of interesting specimens, of this species, showing variations in form: his 488 with thin irregularly crenate-dentate leaves; 490 in large berried, ripe fruit and with very thick, entire leaves; 487 with iliciform, sharp, spinous teeth to all leaves; and 489 in which most of the leaves are tri-foliolate, those that are entire being somewhat spinose toothed.

Page 167

***Malosma laurina* Nutt.**

In fine flowering condition. Descanso Canyon, July 16, 1922, *Knopf* 502. "Usually single trunked, irregular in growth but not exactly crooked. Sometimes in clumps or from two to six main stems. Seldom over ten feet high."

Page 168

Rhamnus insulus Greene.

Pebble Beach Canyon, in full fruit, Sept. 17, 1922, *Knopf* 514. Mr. Knopf says: "The fruit was a favorite masticatory among the Indians. It tinged the saliva yellow and caused the skin to become, at death, decidedly so. It was used, like Cascara, as a laxative and to correct a too prolonged acorn diet."

Page 189

Svida catalinensis Millsp.

Specimens in fruit have come in from *Knopf* (483) July 9, 1922. The fruits are leaden color, hairy, pyriform-ovate, 3x2.5 mm., but not fully matured. It appears that mature fruits are seldom found as they are removed by birds even before fully ripe. Mr. Pollay first returned this species from Catalina, sending specimens to *McClatchie* in 1890. Holder, in his "Channel Islands of California" 238 (1910) refers to the species as *Cornus Polleyi* without description. Mr. Roeding, of Fresno, California, mentions the tree under the name *Cornus glabrata* in "The Catalina Islander" Nov. 1, 1922.

Page 196 Gentianaceae

Eustoma silenifolium Salisb.

Mr. James M. Grant lists this species in "The Catalina Islander," Dec. 9, 1919. No specimen from Catalina has been seen by us in his herbarium nor has it appeared in the collection of others.

Page 218

Lycium Richii Gray

A root cutting (from the original clump of this species that was destroyed about 25 years ago) was planted in Avalon, near a house known as the "Isabel." "The resulting growth is about 12 feet high. On account of lack of proper soil and moisture it is not in good condition." *Knopf* 509 in full fruit. The original clump was known as the "Banyan", on account of its limbs drooping to the ground, though they never rooted.

Page 229

Heliotropium chenopodioides Willd. ?

The type has not been seen. *H. curassavicum* L., typically of the Atlantic seaboard and the West Indies, has the nutlets strongly marked by a round scar. Willdenow's name, given to a plant of the Pacific coast, is probably applicable to the Catalina species, although this cannot be determined definitely from the meager description. The situation is complicated further by the possible existence of more than one species on the mainland, a problem to be solved by a monographer—Macbride.

Page 229

Mentha piperita L.

Knopf 511. Further specimens, in full flower, from his original locality, wet, compact silt and loam around a spring at Empire Quarry, Oct. 31, 1922.

Page 252

***Lonicera catalinensis* Millsp.**

Mr. *Knopf* send in a full fruited specimen from upper Bulrush Canyon, No. 519 on which he notes: "Yellow-fruited honeysuckle, three vines only; my 172 bears scarlet blossoms and bright red fruits." There are no characters differentiating these forms. While the flowers and berries differ in color the seeds and other characters are the same.

Page 266

***Solidago californica* Nutt.**

Mr. *Knopf* has evidently found Mrs. Trask's original locality for this species. He sends in as No. 496, a number of fine specimens gathered Sept. 24, 1922, of which he says: "Up to 5 feet high, near the first stream crossing on the Coach Road as it descends Middle Ranch Canyon."

Page 266 Compositae

GRINDELIA Willd.

Coarse herbs or suffrutescent plants, the California species all perennials. Basal leaves commonly petioled; the cauline sessile by a broad base. Herbage in ours glabrous or nearly so but balsamic-viscid. Heads gummy, medium-sized or large, in panicles or cymes, rarely solitary or sessile, ours with conspicuous yellow rays. Involucre campanulate or hemispheric; the bracts many-ranked, firm-herbaceous, often with attenuate squarrose points. Style-appendages lanceolate or linear. Achenes short, truncate, compressed or turgid, glabrous. Pappus of 2 to 8 awns or small scales, very readily deciduous.

1. ***G. robusta* Nutt. Tr. Am. Philos. Soc. ser. 2, 7:314 (1841).**

Stems mostly erect, 3-6 dm. high: leaves usually oblong to ovate or lanceolate and acute, in a few cases wider above and obtuse, sharply serrate or denticulate or the uppermost entire; the middle cauline 3-5 cm. long, 1-3 cm. wide; heads few, in a terminal cyme, sessile and leafy-bracted, or pedunculate and the bracts less obvious: involucre 20-25 mm. broad: bracts with attenuate squarrose or recurved tips: mature achenes mostly with a 1 or 2-dentate, often oblique border at summit: pappus-awns 2 to 8.

While *G. robusta* is usually found in the neighborhood of the sea, the Catalina station is as far inland as possible on the island, i. e., at the upper end of Middle Ranch Canon. *Knopf* 493, Aug. 13, 1922.

This is the first return of a *Grindelia* from the island.

Page 271

***Baccharis pilularis* DC.**

Full and characteristic specimens of this species were collected at Little Harbor *Knopf* 197. Mr. *Knopf* says: "Found thickly from Empire Landing up and over the divide and down to Little Harbor. Also a few plants in Middle Ranch and Avalon Canyons. It forms a bush growth six feet high and is very showy when in bloom.

Page 272.

***Conyza Coulteri* Gray**

Additional specimens of this species were collected at Empire Quarry, Aug. 27, 1922, by *Knopf*, 512.

Page 277

***Coinogyne carnosa* Less.**

Low matted growth forming solid mats many feet in diameter on the tide flats of Catalina Harbor, *Knopf* 501.

Page 297

***Perezia microcephala* (DC.) Gray.**

Fine fruiting specimens together with three beautiful photographs of a large clump of this species from Middle Ranch Canyon, Sept. 10, 1922, *Knopf* 495.

Page 29

Johnson, Frank W.

Collected on Catalina, December, 1904, September, 1905, and March-April, 1910. The first two collections were made in the vicinity of Avalon, Pebble Beach, along the Coach Road to Summit and in the vicinity of Moonstone Beach. The collection of 1910 was made at Middle Ranch and along Middle Ranch Canyon. The two collections comprise about 400 plants now in the private herbarium of the collector.

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PLATES II to XIV

(Plate XII faces page 306)



BLACK JACK.

MT. BANNING.
CHANNEL SLOPE, FROM THE SUMMIT.

LONG POINT.



FIG. 1. PEBBLE BEACH.
LOOKING WEST FROM POINT LOOKOUT.



FIG. 2. BIRD ROCK.
SHIP ROCK IN MID-DISTANCE BEYOND.



FIG. 1. ECHO LAKE.
LOOKING EAST TOWARD BLACK JACK.



FIG. 2. ECHO LAKE.
LOOKING WEST FROM BASE OF BLACK JACK.



FIG. 1. *SAMBUCUS CAERULEA* Raf
LARGE ELDER TREE ON THE GOLF LINKS.



FIG. 2. *ADENOSTOMA FASCICULATUM* H. & A.
GREASEWOOD IN FLOWER.



FIG. 1. *QUERCUS TOMENTELLA* Engelm.
ISLAND OAK.



FIG. 2. VALE IN BULRUSH CANYON.
SHOWING GROVE PRINCIPALLY OF ISLAND OAK.



FIG. 1. TOP OF IRONWOOD IN BLOOM.



FIG. 2. GROVE IN SWAIN'S CANYON.



FIG. 3. SHOWING BARK CHARACTER.

LYONOTHAMUS FLORIBUNDUS Gray.



FIG. 1. *LAVATERA ASSURGENTIFLORA* Kell.
MALVA ROSA, TRANSPLANTED TO BANNING HOUSE, ISTHMUS.



FIG. 2. *OPUNTIA MEGACANTHA* Salm-Dyck.
YELLOW TUNA ON RIDGE OF DESCANSO CANYON.



FIG. 1. *COREOPSIS GIGANTEA* Hall.
NIGGER-HEAD AND TUNAS ON BIRD ROCK.



FIG. 2. *COREOPSIS GIGANTEA* Hall.
NIGGER-HEAD IN FULL BLOOM AT THE ISTHMUS.



FIG. 1. *SIDA CATALINENSIS* sp. nov.
CATALINA DOGWOOD. TRUNK WITH SHOOTS.

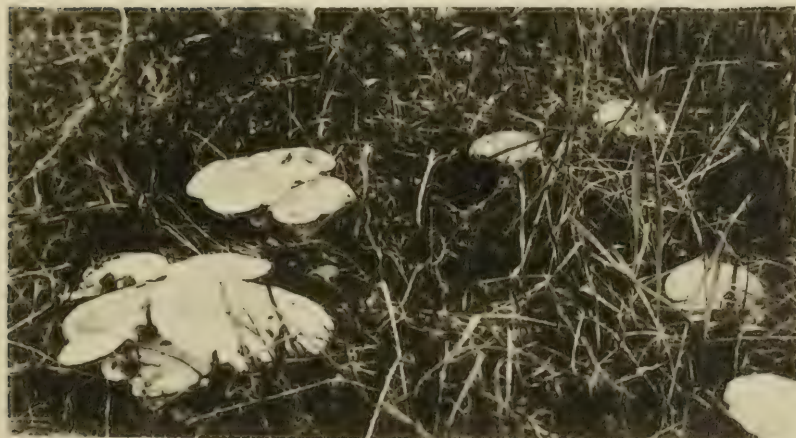


FIG. 2. *TRICHOLOMA COLLYBIIFORMIS* Murrill.
TRICHOLOMA MUSHROOM.



FIG. 1. *STYLOPHYLLUM INSULARE* Rose.
ISLAND STONECROP OR LIVE-FOR-EVER.

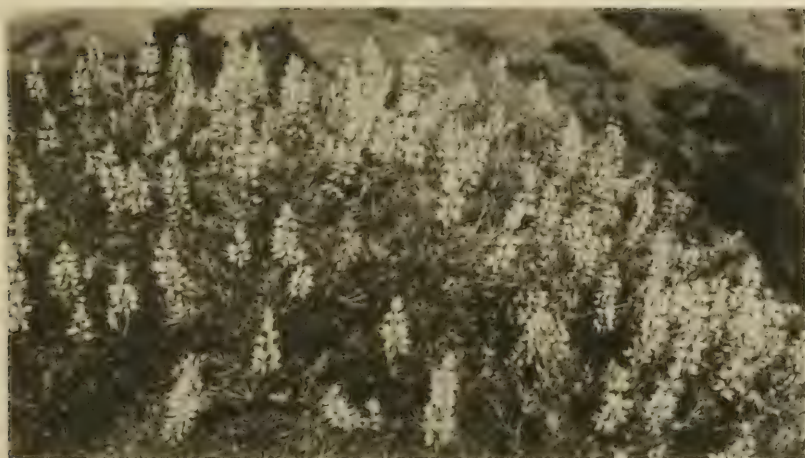


FIG. 2. *LUPINUS HALLII* Abrams.
GIANT LUPINE IN FULL FLOWER.



FIG. 1. *COREOPSIS GIGANTEA* Hall.
NIGGER-HEAD, IN FRUIT, 7 FEET TALL.



FIG. 2. *BERGEROCACTUS EMORYI* B. & R.
SNAKE CACTUS.



FIG. 3. *TOXICODENDRON DIVERSILOBUM* Greene.
POISON IVY KILLING OAKS IN BULRUSH CANYON.



FIG. 1. *VITIS GIRDIANA* Muns.
WILD GRAPE IN COTTONWOOD CANYON.



FIG. 2. *ERIOGONUM NUDUM* Dougl.
WILD BUCKWHEAT.



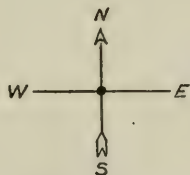
CATALINA ISLAND

— California —

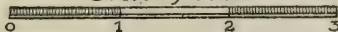
Compiled to Accompany
UGH and NUTTALL'S FLORA

Museum of Natural History
Chicago

1. Avalon
2. Avalon V
3. Avalon R
4. Beacon S
5. Golf Lin
6. Big Wasl
7. Rock Spr
8. Rock Fal
9. Chicken
10. Piedra Es
11. Equestria
12. Nolava C
13. Snake Ca
14. Sage Can
15. Silver Ca
16. Grand Ca
17. Coach Ro
18. Trail to F
19. Old Isthm
20. Echo Lak
21. Hay Pres
22. Middle R
23. Cape Can
24. Middle R
25. Eagle's M
26. Black Jac
27. Orizaba
28. Cottonwo
29. Little Ha
30. Silver Kn
31. Mt. Visca
32. Bulrush C
33. Isthmus
34. Isthmus
35. Fisherma
36. Bird Rock



Scale of Miles



SANTA CATALINA ISLAND

— California —

Map Compiled to Accompany
MILLSPAUGH ^{and} NUTTALL'S FLORA

Field Museum of Natural History
Chicago

LOCALITIES

- | | |
|----------------------------|-------------------------|
| 1. Avalon | 37. Ship Rock |
| 2. Avalon Valley | 38. Ironwood Gully |
| 3. Avalon Run | 39. Catalina Harbor |
| 4. Beacon St. Canyon | 40. Ballast Point |
| 5. Golf Links Canyon | 41. Fourth o'July |
| 6. Big Wash Canyon | 42. Cherry Valley |
| 7. Rock Spring Canyon | 43. Howland's |
| 8. Rock Falls Canyon | 44. Johnson's |
| 9. Chicken Johnny's | 45. Parson's |
| 10. Piedra Escalera Canyon | 46. Silver Peak |
| 11. Equestrian Trail | 47. Mt. Torquemada |
| 12. Nolava Canyon | 48. Pebble Beach Head |
| 13. Snake Canyon | 49. Pebble Beach |
| 14. Sage Canyon | 50. Pebble Beach Canyon |
| 15. Silver Canyon | 51. Lookout Point |
| 16. Grand Canyon | 52. Jewish Point |
| 17. Coach Road | 53. Seal Rocks |
| 18. Trail to Black Jack | 54. Upper Pebble Beach |
| 19. Old Isthmus Trail | |
| 20. Echo Lake | 55. Mt. Washington |
| 21. Hay Press Chute | 56. Mt. Martha |
| 22. Middle Ranch Canyon | 57. Mt. Shatto |
| 23. Cape Canyon | 58. Mt. Wilson |
| 24. Middle Ranch | 59. Descanso Canyon |
| 25. Eagle's Nest | 60. Hamilton Canyon |
| 26. Black Jack | 61. Cherry Canyon |
| 27. Orizaba | 62. Rattlesnake Canyon |
| 28. Cottonwood Canyon | 63. Gallagher's Canyon |
| 29. Little Harbor | 64. Banning's Canyon |
| 30. Silver Knob | 65. White's Landing and |
| 31. Mt. Viscaino | Swains Canyon |
| 32. Bulrush Canyon | 66. Moonstone Beach |
| 33. Isthmus | 67. Long Point |
| 34. Isthmus Harbor | 68. Empire Landing |
| 35. Fisherman's Cove | 69. Salta Verde Ridge |
| 36. Bird Rock | 70. Bulrush Ridge |

